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**MASTERS DEGREE IN LAW (LLM)**

**MINOR DISSERTATION**

**TOWARDS A LEGAL REGIME FOR LIMITING**  
**SHIP-SOURCE GREENHOUSE GAS EMISSIONS**

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**DECLARATION**

Research dissertation presented for the approval of Senate in fulfilment of part of the requirements for the Masters Degree in Law (LLM) in approved courses and a minor dissertation. The other part of the requirement for this qualification was the completion of a programme of courses.

I, DANIEL ALEXANDER PAUL, hereby declare that I have read and understood the regulations governing the submission of Masters Degree in Law (LLM) dissertations, including those relating to length and plagiarism, as contained in the rules of this University, and that this dissertation conforms to those regulations.

**Signature:**

**Date: 26 August 2009**

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## ABSTRACT

There is currently no international instrument in place for limiting ship-source greenhouse gas emissions. If left unregulated ship-source greenhouse gas emissions will continue to increase at a rate exceeding any other industry or nations' emissions. This is unacceptable in the face of current global efforts to reduce greenhouse gas emissions. There is no easy solution as to how the maritime industry should be regulated in this regard. Indeed it is a complicated problem for a highly complex and global industry. This minor dissertation covers the main international legal context towards developing a legal regime for limiting greenhouse gas emissions. The most important international conventions discussed are LOSC, MARPOL Annex VI and the UNFCCC. IMO's efforts over the years to develop a legal regime are discussed as are market-based mechanisms and technical measures to incentivize the shipping industry to reduce its greenhouse gas emissions. The precautionary approach which underlines these legal and policy developments is briefly outlined. Current best practices towards limiting ship-source greenhouse gas emissions in the EU, USA and Australia are described, as well as the jurisdictional context for States wishing to enforce this new legal regime in the future. The conclusion to this minor dissertation suggests that a single all encompassing international legal regime is required for limiting ship-source greenhouse gas emissions. Such an instrument can only succeed if there is consensus amongst Parties of the IMO and the UNFCCC, for a uniform global, but differentiated responsibility mandate towards limiting ship-source greenhouse gas emissions.

**LIST OF ACRONYMS**

AAUs	Assigned Amount Units
AIRS	Applicable International Rules and Standards
ANPR	Advanced Notice of Proposed Rulemaking
CAA	Clean Air Act
CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
Cesa	Community of European Shipyards' Association
CFC	Chlorofluorocarbon
CH <sub>4</sub>	Methane
CMTI	Centre for Maritime Technology and Innovation
CO <sub>2</sub>	Carbon dioxide
COP15	Copenhagen Conference on Climate Change in December 2009
DWT	Deadweight Tonnes
EC	European Commission
ECA	Emission Control Area
EEDI	Energy Efficiency Design Index
EEOI	Energy Efficiency Operational Index
EEZ	Exclusive Economic Zone
EIT	Economies in Transition
EPA	Environmental Protection Agency
ERUs	Emission Reduction Units
ETS	Emissions Trading Scheme

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EU	European Union
FOC	Flags of Convenience
GAIRS	Generally Accepted International Rules and Standards
GHG	Greenhouse Gas
GT	Gross Tonnes
HFC	Hydrofluorocarbon
HFO	Heavy Fuel Oil
IAPP	International Air Pollution Prevention
ICAO	International Civil Aviation Organisation
ICCT	International Council on Clean Transportation
ICF	International Compensation Fund
ICS	International Chamber of Shipping
IMERS	International Maritime Emissions Reduction Scheme
IMO	International Maritime Organisation
IPCC	Intergovernmental Panel on Climate Change
ISM	International Management Code for the Safe Operation of Ships and for Pollution Prevention
JI	Joint Implementation
LNG	Liquefied Natural Gas
LOSC	Law of the Sea Convention (1982 United Nations Convention on the Law of the Sea)
LRTAP	Long-range Transboundary Air Pollution and its Protocols of 1979
MARPOL	International Convention for the Prevention of Pollution from Ships 1973 and the Protocol of 1978

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MEPC	Marine Environment Protection Committee
METS	Maritime Emissions Trading Scheme
MDO	Marine Diesel Oil
N <sub>2</sub> O	Nitrous oxide
NGO	Non-Governmental Organisation
NO <sub>x</sub>	Nitrogen oxide
O <sub>3</sub>	Ozone
PFC	Perfluorocarbon
PM	Particulate Matter
ppm	parts per million
RIAA	(United Nations) Reports of International Arbitral Awards
RPM	Revs Per Minute
SECA	Sulphur Emission Control Area
SEMP	Ship Energy Management Plan
SF <sub>6</sub>	Sulphur hexafluoride
SMS	Safety Management System
SOLAS	International Convention on the Safety of Life at Sea of 1974 and the Protocol of 1978
SO <sub>x</sub>	Sulphur oxide
UK	United Kingdom
UN	United Nations
UNCED	United Nations Conference on Environment and Development, 1992
UNCLOS	United Nations Conference on the Law of the Sea

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UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change, 1992
US	United States
USA	United States of America
UV	Ultraviolet
VOC	Volatile Organic Compound
WSSD	World Summit on Sustainable Development, 2002

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## 1 CHAPTER ONE: INTRODUCTION

In the 55<sup>th</sup> meeting of the International Maritime Organisation's (IMO) Marine Environment Protection Committee (MEPC) in October 2006, the Committee noted that the impact of greenhouse gas emissions from the burning of marine fuel oil on climate change is a serious concern and even though shipping is considered an environmentally friendly mode of transport, it too must change with the times and take action to reduce its own greenhouse gas emissions. If it does not, then shipping will fall behind other industries and become one of the largest producers of greenhouse gas emissions in the future.<sup>1</sup>

Shipping is generally recognised by the public as a dirty, polluting, substandard industry. The truth is that shipping is the most environmentally friendly mode of transport, which is responsible for more than 90 per cent of all global trade.<sup>2</sup>

However, the shipping industry is currently responsible for about 3 per cent of the global carbon dioxide (CO<sub>2</sub>) emissions. This makes shipping the sixth largest emitter of CO<sub>2</sub> in the world when compared to national emissions.<sup>3</sup>

There is currently no international instrument in place for limiting ship-source greenhouse gas emissions. If left unregulated ship-source greenhouse gas emissions will continue to increase at a rate exceeding any other industry or nations' emissions. Scientists estimate that at the rate the shipping industry is growing and if the shipping industry is left unregulated with respect to ship-source greenhouse gas emissions then these ship emissions could increase between 150 to 250 per cent by 2050 from the year 2007.<sup>4</sup>

This is unacceptable in the face of current global efforts to reduce greenhouse gas emissions to more sustainable levels. Shipping could become one of the single largest sources of greenhouse gas emissions in the near future.

There is no easy solution as to how this industry should be regulated indeed it is a complicated problem for a highly complex and global industry.

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<sup>1</sup> IMO, 'Prevention of Air Pollution from Ships' (2008).

<sup>2</sup> Oceana 'Shipping Impacts on Climate: A Source with Solutions' (2008) at 2.

<sup>3</sup> Ibid.

<sup>4</sup> IMO, 'Second IMO GHG Study 2009, Final report covering Phase 1 & Phase 2' (April 2009) at 7.

CO<sub>2</sub> accounts for more than 50 per cent of the total greenhouse gas emissions in the world; other greenhouse gases include: water vapour, methane (CH<sub>4</sub>), ozone (O<sub>3</sub>), nitrous oxide (N<sub>2</sub>O), sulphur hexafluoride (SF<sub>6</sub>), hydrofluorocarbon (HFC), perfluorocarbon (PFC) and chlorofluorocarbon (CFC).<sup>5</sup>

According to the United Nations Framework Convention on Climate Change (UNFCCC) Article 1(5) "Greenhouse gases" '...means those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared [longwave] radiation....' and the Kyoto Protocol, Annex A lists six greenhouse gases to be covered by the Protocol: '...carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbon (HFC), perfluorocarbon (PFC) and sulphur hexafluoride (SF<sub>6</sub>)....'

"Emissions" are defined by UNFCCC Article 1(4) as '...the release of greenhouse gases and/or their precursors into the atmosphere over a specified area and period of time....'

"Source" as in "ship-source" for the purposes of this minor dissertation is defined by UNFCCC Article 1(9) as '...any process or activity which releases a greenhouse gas, an aerosol or a precursor of a greenhouse gas into the atmosphere....'

Developing legal instruments and regulatory measures is the only way forward to initiate significant changes in the shipping industry, because policy and legislative initiatives tend to lead the technical and operational developments in this industry.

Chapter Two of this minor dissertation serves to provide a thorough background to the applicable international air pollution law and climate change law relevant to a future legal regime for limiting ship-source greenhouse gases. It covers in some detail the most important historical and current international conventions such as: the 1979 Geneva Convention on Long-range Transboundary Air Pollution (LRTAP), the 1985 Vienna Convention for the Protection of the Ozone Layer (Vienna Convention), the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol), the UNFCCC, the Kyoto Protocol, the International Convention for the Prevention of Pollution from Ships 1973 and

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<sup>5</sup> UNFCCC 'Uniting on Climate: A Guide to the Climate Change Convention and the Kyoto Protocol' (2007).

the Protocol of 1978 (MARPOL 73/78) and the United Nations Convention on the Law of the Sea (LOSC). These conventions were studied and analysed. Certain important articles from these various conventions have been quoted, because they were deemed to be directly relevant to establishing legal fact and definition for the topic of this minor dissertation. Other articles have also been highlighted, because they provide a suitable legal framework of a State's duties and enforcement rights towards limiting ship-source greenhouse gas emissions.

Chapter Three then importantly outlines the context of the different types of jurisdiction for international law applicable to ship-source air pollution, it covers the concepts of generally accepted/applicable international rules and standards relevant to an international legal regime for limiting ship-source greenhouse gas emissions and concludes with a discussion on flags of convenience (FOC) relevant to legal developments in greenhouse gas emission reductions from ships.

Chapter Four provides a thorough discussion on a wide range of best practices, proposed policies and other approaches for limiting ship-source greenhouse gas emissions. The chapter begins by describing IMO's efforts to introduce a greenhouse gas emissions reduction regime for ships. It goes through all the relevant meetings of the MEPC and intersessional working groups and covers reports from major IMO studies. This section discusses the issues raised and the ideas developed from these sessions, which are relevant to developing a legal regime for limiting greenhouse gas emissions.

The next section in Chapter Four discusses the various measures for limiting ship-source greenhouse gas emissions. It begins by discussing some of the available market-based greenhouse gas emission reduction mechanisms. Contrary to the UNFCCC, the IMO does not differentiate between developing and developed States and its regulations apply to all ships regardless of the nationality. This is currently a topic of heated debate amongst shipping nations, as some countries believe that shipping should differentiate between flag States for allocating carbon emissions, as per the UNFCCC requirements. This conflict could jeopardise the need for a swift development of a uniform international legal regime for limiting ship-source greenhouse gas emissions.

However, the solution to this problem could be overcome by applying Dr. Stochniol's International Maritime Emissions Reduction Scheme (IMERS) principle of global, but differentiated responsibilities, which collaborates between the

requirements of the IMO and the mandate laid down by the UNFCCC and the Kyoto Protocol.

Some operational and technical measures for monitoring and limiting greenhouse gas emissions will be discussed, which are essential for physically transforming the industry. These measures can be cost-effective and could provide incentives for ship owners to operate their ships as energy efficiently as possible so that emissions can be reduced.

Chapter Four also briefly mentions the principle of the precautionary approach, which forms the basis of the development of an international legal regime for limiting ship-source greenhouse gas emissions, which concerns the environment, industry and climate change.

A description of some of the relevant international, regional and state, best practices is provided, which are currently being developed in the IMO, European Union (EU), United States of America (USA) and Australia towards implementing legislation for limiting ship-source greenhouse gas emissions

Finally, Chapter Five provides the conclusion to this minor dissertation with some recommendations for the way forward towards developing a legal regime for limiting ship-source greenhouse gas emissions.

Information for this minor dissertation has been collected from many different sources over a period of one year such as legal books, legal journals, papers and reviews, international conventions, technical and policy reports, presentations, media reports and the internet. See the Bibliography for a complete list of all material researched for this minor dissertation.

In December 2009 the United Nations (UN) Intergovernmental Panel on Climate Change (IPCC) will be holding an important climate change conference in Copenhagen. From this meeting it is expected that much more onerous regulations will be developed to tighten the control on global warming and it is anticipated that the shipping industry will finally be included in the international climate change framework.

The issue of limiting greenhouse gas emissions from the shipping industry is a fairly new topic of law. The fact that the shipping industry was not included in the UNFCCC is testimony to this. The Kyoto Protocol Article 2(2) briefly mentions the

need for Parties to limit greenhouse gas emissions from marine bunker fuels and to work through the IMO in order to achieve this. However, no further legislation specifically relating to limiting greenhouse gas emissions from ships has been developed and the regulations which do exist to limit air pollution from ships such as those found in MARPOL Annex VI also do not specifically account for greenhouse gas emissions from ships.

The issues surrounding climate change have become so topical and relevant to our everyday lives and much has been written in general about global warming. Politicians, governments, non-governmental organisations (NGOs), private industry and the public in general are becoming more and more aware of the importance to limit our carbon footprint and are collectively taking action to reduce greenhouse gas emissions.

Following the Copenhagen Conference on Climate Change (COP15) in December 2009 and leading up to the end of 2011, which is when the Kyoto Protocol expires, it is anticipated that there will be a significant increase in climate change legislation across the world. States will need to ensure that they meet their carbon emission targets set by the Kyoto Protocol. From the beginning of 2012 a new or revised Kyoto Protocol will be passed with even stricter limits on emissions. Although the shipping industry was left out of the first round of the Kyoto Protocol it can safely be assumed that in the next few years a binding international legal instrument on limiting ship-source greenhouse gas emissions will be introduced as part of the global efforts to stabilise and reduce climate change.

## 2 CHAPTER TWO: APPLICABLE INTERNATIONAL LAW

### 2.1 Background to Air Pollution Law

International customary laws and soft laws related to preventing air pollution existed before the binding international conventions on air pollution were first developed in the 1970s.

The *Trail Smelter Arbitration* (US v Canada) (1938 and 1941) 3 RIAA 1905 is a classic example of an international customary law case covering international transboundary air pollution. The case was brought by the United States (US) Government against the Canadian Government, because of State responsibility for transboundary effects caused or experienced in US territory. US wheat farmers argued that for many years sulphurous emissions had blown over onto their farms from Canada and caused damage to the wheat crops and local vegetation. The SO<sub>x</sub> emissions had reacted with water vapour in the air to form an acidic precipitation, commonly known as 'acid rain' ie a mild form of sulphuric acid. This acid rain is highly corrosive even in mild doses and it destroyed the farmers' crops. An International Tribunal was held and a causal relationship was found between the sulphur emissions from the iron ore smelter and the damages caused to the crops in the US. The Tribunal also held that the '...activities in one country's territory must not cause harm to the interests of another state....'<sup>6</sup>

This principle later became the foundation of international environmental customary law and the cornerstone of the 1972 Stockholm Declaration:<sup>7</sup>

Principle 21: States have, in accordance with the Charter of the United Nations and the principles of international Law, the sovereign right to exploit their own resources pursuant to their own environmental policies and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

In addition to Principle 21, Chapter 17 of the Agenda 21 action plan from the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, 1992, calls for the protection and conservation of the marine environment from pollution. This would equally apply to air pollution of the marine environment, such as greenhouse gas emissions from ships. More recently, the

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<sup>6</sup> Jan Glazewski, *Environmental Law in South Africa* 1ed (2000) at 37.

<sup>7</sup> *Ibid* at 45.

Plan of Implementation, UN World Summit on Sustainable Development (WSSD) in Johannesburg, South Africa, 2002, re-iterates the need to implement Chapter 17 of Agenda 21.<sup>8</sup>

However, in earnest, the 1972 United Nations Conference on the Human Environment in Stockholm marked the beginning of international awareness and action towards preventing air pollution.

These efforts resulted in the first internationally legally binding framework for limiting air pollution, which became known as the 1979 Geneva Convention on Long-range Transboundary Air Pollution. LRTAP formed the foundation for subsequent air pollution regulations and conventions. LRTAP defines the concept of international air pollution in Article 1 as:

- (a) “Air Pollution” means the introduction by man, directly or indirectly, of substances or energy into the air resulting in deleterious effects of such a nature as to endanger human health, harm living resources and ecosystems and material property and impair or interfere with amenities and other legitimate uses of the environment, and “air pollutants” shall be construed accordingly;
- (b) “Long-range transboundary air pollution” means air pollution whose physical origin is situated wholly or in part within the area under the national jurisdiction of one State and which has adverse effects in the area under the jurisdiction of another State at such a distance that it is not generally possible to distinguish the contribution of individual emission sources or groups of sources.

Further protocols were added to this Convention over time with the most relevant to the topic of greenhouse gas emissions being the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone.

During the 1970s and 1980s the United Nations Environment Programme (UNEP) responded to startling evidence provided by the scientific community of the destruction of the Earth’s ozone layer.<sup>9</sup> It was decided that it was time to develop an international framework convention to protect the ozone layer and limit ozone-depleting substances from being used and these efforts resulted in the 1985 Vienna Convention for the Protection of the Ozone Layer.<sup>10</sup> The Vienna Convention became the first international legal instrument to tackle air pollution on

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<sup>8</sup> Chapter 17 of Agenda 21 defines the principles for the protection of the marine environment and its conservation and sustainable development. This applies the precautionary approach and ecosystem approach.

<sup>9</sup> Glazewski op cit note 6 at 53.

<sup>10</sup> Ibid.

a global scale with 193 Parties signed up to the Convention. Its main objective is to mitigate the impact of greenhouse gases on the ozone layer.

Then, in 1987, the Montreal Protocol on Substances that Deplete the Ozone Layer was signed. This agreement built on the foundations laid by the Vienna Convention to limit and reduce ozone-depleting substances.<sup>11</sup>

The formulation of the Montreal Protocol came about due to increasing international concern about the state of the Earth's ozone layer, which had developed two large holes in the ozone layer over the Earth's North and South Poles. Scientists proved that high concentrations of ozone-depleting substances can destroy the ozone layer such as aerosols, refrigerant gases and fire extinguishers ie chlorofluorocarbons (CFCs) and halons, respectively.

The ozone layer is important, because it protects the Earth from direct exposure to the Sun's ultraviolet (UV) rays. CFCs are also considered as a greenhouse gas. Therefore, CFCs and other similar air pollutants act as a doubled-edged sword, in that they destroy the ozone layer allowing additional UV radiation to penetrate the Earth's atmosphere and then act as a blanket preventing the reflected longwave radiation from exiting the atmosphere and thus heat accumulates in the atmosphere, which increases the average global surface temperature. This process is known as the 'greenhouse effect' and hence the name for these types of gases, which cause this effect.

## 2.2 UNFCCC & Kyoto Protocol

To develop a legal regime for limiting ship-source greenhouse gas emissions the regulations pertaining to climate change have to be respected.

The UNFCCC and Kyoto Protocol cover all greenhouse gas emissions not covered by: LRTAP, the Vienna Convention and the Montreal Protocol.

One of the key objectives of the UNFCCC is to stabilise and reduce greenhouse gas emissions, because increases in global average surface temperature depend directly upon the increase in concentration of greenhouse gas emissions in the atmosphere.<sup>12</sup> If the concentrations of greenhouse gas emissions are reduced then climate change will be reduced. Scientific evidence suggests that

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<sup>11</sup> Ibid.

<sup>12</sup> UNFCCC op cit note 5.

if CO<sub>2</sub> stabilises at 550ppm there will be a high probability that the global average surface temperature will rise by more than 3°C by the end of this century.<sup>13</sup> The consequences of this happening will be catastrophic.

Therefore an international response to climate change was developed in the form of the UNFCCC, which came into force in March 1994 and has received 192 ratifications.<sup>14</sup>

The objective of the UNFCCC according to Article 2 is as follows:

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow the ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

Evidence suggests that an increase in the global average temperature of no more than 2°C or a maximum threshold of 450ppm of CO<sub>2</sub> is sustainable in the long term for climate change; however, the time to act is now, as current estimates of global CO<sub>2</sub> emissions have almost reached the critical threshold of 450ppm.<sup>15</sup>

In light of the above mentioned targets for a sustainable climate, one of the UNFCCC's main duties according to Article 3(1) is to '...protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities...'

Article 4 of UNFCCC states the commitments of all Parties to the Convention, taking into account '...their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances....'

According to UNFCCC Article 4, Parties have to develop an inventory of their greenhouse gas emissions and submit reports on their actions and programmes to combat climate change. Annex I and Annex II countries, which are developed

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<sup>13</sup> Andrew Macintosh 'Climate Change and Australian Coastal Shipping' (2007) at 12.

<sup>14</sup> Ibid at 9.

<sup>15</sup> Ibid at 14.

nations as well some countries which are in a state of transition to a market economy ie Eastern Europe are required to stabilise their greenhouse gas emissions to levels last experienced in 1990; see Table 1 in the Appendix.

Therefore, the countries which consume the most fossil fuels, which produce CO<sub>2</sub> and other greenhouse gases, are the most industrialised, developed nations and therefore according to UNFCCC Article 4(1) those countries are the biggest producers of greenhouse gas emissions and therefore should have to contribute the most to mitigating and combating climate change.

The Kyoto Protocol was signed in 1997 and came into force on 16 February 2005. As the Preamble to the Protocol indicates, this agreement includes all the principles and commitments of the UNFCCC, and expands on it particularly by requesting further obligations of Annex I countries to reduce their greenhouse gas emissions within a certain window period. The main obligation required of the Annex I countries is that they do not exceed their assigned amounts of emission and that they reduce their greenhouse gas emissions by 5 per cent below 1990 levels between 2008 and 2012, as required by the Kyoto Protocol Article 3(1), which states:

The Parties included in Annex I shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases... do not exceed their assigned amounts... with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.

See Table 1 in the Appendix for a list of the Annex I countries and their assigned amounts. The values indicate the per cent reduction commitment (per cent of base year or period), which a country must commit to, such as Australia (108 per cent) ie allowed to increase their greenhouse gas assignment by 8 per cent of the 1990 level or the United Kingdom (UK) (92 per cent) ie must reduce by 8 per cent of the 1990 level.

The Clean Development Mechanism (CDM) is the mechanism by which the Annex I countries can invest in emission reduction projects in developing countries and receive credits for reducing their greenhouse gas emissions. These CDM projects contribute to sustainable development in Non-Annex I countries, which will hopefully be hosting these projects and therefore contribute financially and technologically to these developing nations, which incidentally is one of the added responsibilities of Annex II countries. The country hosting these CDM projects

generates Certified Emission Reductions (CERs) and these can ultimately be used by Annex I countries in reducing their emissions and thereby meet their emission reduction targets. Kyoto Protocol Article 12(2), states:

The purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.

Sometimes in order to achieve these reductions in greenhouse gas emissions Annex I Parties are allowed to undertake Joint Implementation (JI) projects, which is simply a project-based mechanism for investing in carbon sink projects ie CDM projects in other Annex I countries. This is especially the case in Economies in Transition (EIT) countries such as the Baltic States and East European countries, where there is greater opportunity for gaining Emission Reduction Units (ERUs) at lower costs than in the more developed countries such as Canada and the UK. See Kyoto Protocol Article 6(1), which states the following:

For the purpose of meeting its commitments under Article 3, any Party included in Annex I may transfer to, or acquire from, any other such Party emission reduction units resulting from projects aimed at reducing anthropogenic emissions by sources or enhancing anthropogenic removals by sinks of greenhouse gases in any sector of the economy.

An observation, which is relevant to the shipping industry, is that while greenhouse gas emission reduction mechanisms allow Annex I Parties to potentially meet their reduction targets, most of it is done outside of the Annex I States. The Kyoto Protocol is based on assigning emissions to one particular Party, which is responsible for those greenhouse gas emissions.

According to LOSC Article 91(1) a 'genuine link' must exist between the flag State of a ship and the ship owner. Therefore, simply assigning greenhouse gas emissions according to the flag State of a ship would seem the most logical approach. However, shipping is a highly complex and global industry and using this straight forward approach to assign emissions does not make sense when there are numerous parties who should also be responsible for ship-source greenhouse gas emissions such as the cargo owners and the charterers. In light of this the UNFCCC does not include emissions from marine bunker fuels used in international shipping, and they have to be reported separately from the overall emissions of Parties. The provisions of Kyoto Protocol, Article 2(2), states:

The Parties included in Annex I shall pursue limitation or reduction of emissions of Greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organisation and the International Maritime Organisation, respectively.

The market-based mechanism for allowing Parties to reduce emissions is known as the Emissions Trading Scheme (ETS). This allows Annex I Parties to purchase Assigned Amount Units (AAUs) or CERs from CDMs and ERUs from JI projects via an ETS. Units or carbon credits can be traded between any Parties under domestic or regional trading and exchange systems eg the Chicago Climate Exchange in the USA.

Kyoto Protocol Article 17, states:

The Conference of the Parties shall define the relevant principles, modalities, rules and guidelines, in particular for verification, reporting and accountability for emissions trading. The Parties included in Annex B may participate in emissions trading for the purposes of fulfilling their commitments under Article 3. Any such trading shall be supplemental to domestic actions for the purpose of meeting quantified emission limitation and reduction commitments under that Article.

Therefore, the UNFCCC inherently admits that the agreements on limiting greenhouse emissions under the UNFCCC and the Kyoto Protocol are not designed to be able to deal with an industry as complex and as global as the shipping industry. Hence, Article 2(2) of the Kyoto Protocol requires Parties involved in the shipping industry to work through the IMO to enforce regulations and measures to limit ship-source greenhouse gas emissions and reduce them to levels which will prevent any further dangerous anthropogenic interference with climate change.

### **2.3 IMO International Conventions**

During the 1980s the MEPC of the IMO began looking deeper at the cause for growing concern of air pollution from ships and carried out investigations into the quality of marine fuel oils. Norway led a campaign to increase awareness about air pollution from ships and held the Second International Conference on the Protection of the North Sea, in late 1987, which looked at a number of issues, related to air pollution from ships and produced a declaration of action from the North Sea States involved. The declaration signified the intent of these States through a global organising body such as the IMO to improve ‘...quality standards

of heavy fuels and to actively support this work aimed at reducing marine and atmospheric pollution....<sup>16</sup>

The following year Norway submitted their findings to the MEPC, which were subsequently included in the Committee's Work Programme. In March, 1989, at the MEPC's next meeting, numerous States presented papers on marine fuel oil quality and ship-source air pollution and the MEPC agreed to develop a long-term working programme for the prevention of air pollution from ships.

Then in 1990, Norway presented papers to the MEPC covering the topics of SO<sub>x</sub> emissions, NO<sub>x</sub> emissions and greenhouse gas emissions particularly CFCs and halons emitted from the operations of ships.

Following this, in 1991, the MEPC working group held discussions and drafted a document, which led to the adoption of the IMO Assembly Resolution A.719 (17) called the Prevention of Air Pollution from Ships. The Resolution requested the MEPC to draft a new Annex on Prevention of Air Pollution from Ships to be added to MARPOL. Six years later at a conference in September 1997 the new Annex VI of MARPOL 73/78 was adopted by adding a protocol to the Convention, which would include Annex VI.

The International Convention for the Prevention of Pollution from Ships 1973 and the Protocol of 1978 (MARPOL 73/78) is the main international instrument for protecting the marine environment from ship-source pollution. This Convention specifically prohibits the discharge and emission of harmful substances from ships into the marine environment.<sup>17</sup> However, currently these harmful substances do not cover all greenhouse gas emissions.

The Convention introduced the system for surveying, inspecting, and certifying ships that meet the stipulated technical standards, which are contained in the 1978 Protocol (this instrument relates to the safe design and operation of tankers) and the six annexes, which deals with different types of pollutants and prescribes limits on discharges of these pollutants and technical measures required to meet these standards.

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<sup>16</sup> IMO op cit note 1.

<sup>17</sup> MARPOL art 1(1).

The 1997 Protocol (Annex VI) to the MARPOL Convention recognises ‘...the need to prevent and control air pollution from ships....’ MARPOL Annex VI entered into force on 19 May 2005.

MARPOL Annex VI comprises of three chapters:

Chapter 1 – General Provisions: including Regulations 1 to 4.

Chapter 2 – Survey, Certification and Means of Control: including Regulations 5 to 11.

Chapter 3 – Requirements for Control of Emissions from Ships: including Regulations 12 to 19.

The emissions, which are regulated by Annex VI, include Regulation 13 Nitrogen Oxides (NO<sub>x</sub>), Regulation 14 Sulphur Oxides (SO<sub>x</sub>), Regulation 15 Volatile Organic Compounds (VOCs) and Regulation 12 Ozone depleting substances, which prohibits the deliberate emissions of CFCs and halons. Annex VI was based on the LRTAP and 1987 Montreal Protocol, see MARPOL Annex VI Regulation 2(6).<sup>18</sup>

Reductions in greenhouse gas emissions have already been achieved by the successful implementation of MARPOL Annex VI regulations.<sup>19</sup> Estimates of emissions of refrigerants (CFCs and halons) from ships have been made by the UNEP as part of its assessment reports for 1998 and 2006.<sup>20</sup> These estimates are based on the amounts of refrigerant that have been supplied to ships in order to replace lost refrigerant. The reports indicate that there has been a significant decline in CFCs and halons emitted during this period.<sup>21</sup>

The concept of MARPOL Special Areas is included in Regulation 14 of MARPOL Annex VI, which specifically defines the Baltic and North Sea areas as designated Sulphur Emission Control Areas (SECAs).

MARPOL Annex VI, Article 5, stipulates that there must be a valid certificate onboard every ship greater than 400 gross tonnes (GT) in size in order to verify

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<sup>18</sup> Defined in art 1 para 4 of the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, and listed in its Annexes A, B, C or E.

<sup>19</sup> Second IMO GHG Study 2009 op cit note 4 at 52.

<sup>20</sup> Ibid.

<sup>21</sup> Ibid.

that the ship is MARPOL compliant.<sup>22</sup> The flag State is responsible for periodically surveying the ship and if the ship meets the technical and regulatory requirements of MARPOL Annex VI then according to MARPOL Annex VI, Regulation 6, an International Air Pollution Prevention (IAPP) Certificate will be issued.<sup>23</sup>

The port State on behalf of the coastal State may inspect ships in its ports to verify the certificates and compliance with MARPOL technical standards. A ship may be detained if there is no valid certificate(s) onboard. In addition, with or without a valid certificate(s) if there is evidence a ship has violated MARPOL regulations then legal action may be taken, and with due notice to the flag State the ship can be arrested.

MARPOL Annexes I and II are mandatory. The other Annexes are optional and are periodically updated by the IMO's MEPC using the tacit acceptance procedure, which requires member States to lodge an official objection to an amendment by a certain date in order to opt-out.<sup>24</sup>

Thus far there are at least 54 Parties to MARPOL Annex VI, accounting for greater than 75 per cent of the world's merchant fleet, which confirms MARPOL as a truly global convention.

The International Convention on the Safety of Life At Sea of 1974 and the Protocol of 1978 (SOLAS), which incorporates Chapter IX of SOLAS (ISM Code), is the international regulatory convention, which is primarily focused on technical measures to ensure the safety of ships, cargo loading and navigation.

The International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM code), which was included in Chapter IX of SOLAS in 1994 and entered into force in 1998, introduces the consideration for the protection of the marine environment from pollution, including air pollution, into SOLAS. The ISM Code requires ships to develop and implement a Safety Management System (SMS), which includes procedures for limiting ship-source pollution such as greenhouse gas emissions. Valid certificates must be kept on board for port and coastal State inspection to verify SOLAS and ISM Code compliance.

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<sup>22</sup> MARPOL art 5.

<sup>23</sup> Ibid.

<sup>24</sup> MARPOL art 14.

## 2.4 International Law of the Sea

It is fundamental that a future legal regime, which seeks to support the international efforts to stabilise and reduce greenhouse gas emissions for the benefit of humankind and the environment, should consider the protection of the marine environment and prevent marine pollution.

The LOSC is fundamental in providing the international legal framework for limiting ship-source greenhouse gas emissions. LOSC determines the jurisdiction of the maritime zones and sets the international standards and regulations for States to protect and preserve the marine environment.<sup>25</sup> Pollution of the marine environment is defined in LOSC Article 1(1) (4) as:

the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.

Greenhouse gas emissions from ships fall within this definition of pollution of the marine environment. When you take into consideration the international and complex nature of the shipping industry and the significant impact which it has on the marine environment it becomes critical to adopt the relevant principles and obligations of LOSC.

LOSC, Article 19, states that a ship passing through a coastal State's territorial waters is presumed to be innocent unless it is '...considered to be prejudicial...' to the coastal State if the ship engages in '...any act of wilful and serious pollution contrary to this Convention....'<sup>26</sup>

LOSC, Part XII Articles 194, 217 and 218 refer particularly to the obligation, measures and enforcement action, which the coastal State must take to '...prevent, reduce and control pollution of the marine environment....'

Article 197 says that States should '...cooperate on a global or regional basis...' through 'international organisations' ie the IMO to develop and prescribe standards and regulations to protect and preserve the marine environment.

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<sup>25</sup> LOSC, Part XII.

<sup>26</sup> LOSC, art 19(2)(h).

Similarly to the principles enshrined in UNFCCC for equity, cost-effectiveness and fairness and differentiating Parties with respect to their obligations to limit climate change,<sup>27</sup> the LOSC Article 203 established the guidelines for the 'Preferential treatment for developing States', which says the following:

Developing States shall, for the purposes of prevention, reduction and control of pollution of the marine environment or minimization of its effects, be granted preference by international organisations in:

- (a) the allocation of appropriate funds and technical assistance; and
- (b) the utilisation of their specialised services.

LOSC Article 211, calls for global cooperation amongst States to protect and preserve the marine environment by developing, prescribing and implementing Generally Accepted International Rules and Standards (GAIRS) through a competent international organisation eg IMO.

The IMO regulatory conventions developed thus far prescribe international standards and regulations for member States '...to give effect to...' in their State practice in order to prevent 'harmful substances' being discharged into the marine environment.<sup>28</sup>

LOSC Article 212 deals specifically with limiting air pollution of the marine environment. This would include limiting ship-source greenhouse gas emissions from ships. LOSC, Article 212 provides that:

1. States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment from or through the atmosphere, applicable to the air space under their sovereignty and to vessels flying their flag or vessels or aircraft of their registry, taking into account internationally agreed rules, standards and recommended practices and procedures and the safety of air navigation.
2. States shall take other measures as may be necessary to prevent, reduce and control such pollution.
3. States, acting especially through competent international organisations or diplomatic conference, shall endeavour to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control such pollution.

LOSC Article 222 specifically refers to enforcement of air pollution laws protecting the marine environment. This article includes the enforcement of limiting

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<sup>27</sup> UNFCCC, art 3(1), art 3(3) and art 4.

<sup>28</sup> MARPOL art 1(1).

ship-source greenhouse gas emissions from ships. LOSC Article 222 complements LOSC Article 212, as Parties must enforce their laws within their jurisdiction for preventing and limiting pollution of the marine environment from or through the atmosphere. LOSC Article 222 states:

States shall enforce, within the air space under their sovereignty or with regard to vessels flying their flag or vessels or aircraft of their registry, their laws and regulations adopted in accordance with article 212, paragraph 1, and with other provisions of this Convention and shall adopt laws and regulations and take other measures necessary to implement applicable international rules and standards established through competent international organisations or diplomatic conference to prevent, reduce and control pollution of the marine environment from or through the atmosphere, in conformity with all relevant international rules and standards concerning the safety of air navigation.

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### 3 CHAPTER THREE: JURISDICTION

A State's ability to prescribe legislation for its nationals and flagged ships is known as legislative jurisdiction.<sup>29</sup> A State's ability to enforce this legislation is known as enforcement jurisdiction.<sup>30</sup> These principles of jurisdiction are equally applicable to a future legal regime for limiting ship-source greenhouse gas emissions and are described below.

#### 3.1 Prescriptive / Legislative Jurisdiction

Under pre-UNCLOS III rules customary international law developed principles on which flag States ie the country in which a ship is registered may prescribe for example anti-greenhouse gas emission standards on their ships anywhere in the world. In the current UNCLOS III rules LOSC Article 194 prescribes measures for preventing and limiting marine pollution such as greenhouse gas emissions from ships. LOSC Article 212 specifically requires States to prescribe measures for preventing air pollution of the marine environment from ships such as limiting ship-source greenhouse gas emissions. A coastal State ie the country in whose territorial sea or maritime zones a particular ship is sailing, may also prescribe these rules and standards on foreign ships, provided the coastal State does not interfere with innocent passage.<sup>31</sup>

#### 3.2 Enforcement Jurisdiction

According to LOSC Article 217 enforcement jurisdiction by a flag State extends to all its ships and its nationals on ships anywhere in the world and it may take judicial action to enforce for example greenhouse gas emission reduction laws where offences have occurred and institute criminal proceedings against the master of the ship or the ship owner.<sup>32</sup>

LOSC Article 218 defines the enforcement jurisdiction of port States, which may undertake investigation of ships suspected of violating Applicable International Rules and Standards (AIRS) established by the likes of the IMO and if evidence supports these allegations then the port State or flag State may take legal action against the ship.

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<sup>29</sup> RR Churchill and AV Lowe *The Law of the Sea* 3ed (1999) at 344.

<sup>30</sup> *Ibid.*

<sup>31</sup> *Ibid.*

<sup>32</sup> *Ibid* at 348.

According to LOSC Article 220 and MARPOL 73/78 Article 4, a coastal State is under obligation to enforce its jurisdiction by taking action against ships suspected of violating anti-pollution regulations on ships. However, there must be sufficient evidence of pollution and the flag State must be notified of the coastal State's intentions to take legal actions. Alternatively, the flag State may intervene with its own ships and nationals and take legal action as soon as possible.<sup>33</sup>

Finally, the LOSC Article 222 specifically refers to '...enforcement with respect to pollution from or through the atmosphere...' such as ship-source greenhouse gas emissions. In accordance with LOSC Article 212 a State may enforce within its sovereign jurisdiction (the territorial sea and adjacent airspace) national legislation, which implements AIRS established by the likes of the IMO in order to prevent and limit air pollution of the marine environment such as greenhouse gas emissions.

### 3.3 Safeguards and Dispute Settlement

According to LOSC, Part XII, Section 7, Articles 223 to 233, when a State takes legal action or arrests a ship in its jurisdiction for allegedly violating its laws to prevent pollution of the marine environment, which should be applicable *mutatis mutandis* to air pollution, especially ship-source greenhouse gas emission laws, then the State must observe the following procedures:<sup>34</sup>

- Article 223, the State must facilitate the proceedings of the investigation and the representations of State parties involved as well as produce the evidence of the violation.
- Article 224, the State's powers of enforcement against foreign ships can only be carried out by clearly identifiable government warships, ships and aircraft.
- Article 225, the State has a duty when exerting its powers against foreign ships not to cause adverse effects to the marine environment and other ships.
- Article 226, the State investigations may not delay the foreign ship unnecessarily.

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<sup>33</sup> Ibid at 345.

<sup>34</sup> Erik-Jaap Molenaar, *Coastal State Jurisdiction over Vessel-Source Pollution* (1998) at 505.

- Article 227 - 230, the State must not discriminate against foreign ships; it must observe the proceedings and recognised rights of the accused.
- Article 231, the State must notify the foreign ship's flag State.
- Article 232, the State shall be liable for any damages and unlawful measures taken against the foreign ship, if it exceeds any of the safeguards reasonably required.
- Article 233, the State may take appropriate enforcement action against violations of LOSC, Article 42 to safeguard the marine environment in international straits.

### 3.4 GAIRS & AIRS

International shipping is a highly complex and global industry and its markets and regulatory nature are equally as diverse and complicated. Therefore, it is necessary for equitable, cost effective and fair best practices to have prescriptive and enforcement standards and regulations on limiting ship-source greenhouse gas emissions, which are globally uniform.

The LOSC and IMO Conventions such as MARPOL support a global mandate and therefore would provide a regulatory regime for limiting ship-source greenhouse gas emissions, which is applicable to all ships, irrespective of the flags they may fly.

In the context of developing a legal regime for limiting ship-source greenhouse gas emissions it is worthwhile noting that the LOSC only prescribes international standards and regulations to protect the marine environment from the pollution of ships and defines the jurisdiction for its regulations.<sup>35</sup> However, LOSC does not prescribe operational or technical standards and regulations for preventing ship-source greenhouse gas emissions.

A legal regime covering the operational and technical measures would be covered in detail by international regulatory conventions such as MARPOL 73/78 ie MARPOL Annex VI in the case of preventing ship-source air pollution, and SOLAS 74/78 ie the ISM Code, which covers the safe operation of ships for preventing pollution such as greenhouse gas emissions.

## Generally Accepted International Rules and Standards (GAIRS)

According to LOSC Article 21(2), the coastal State can prescribe pollution regulations for foreign ships in innocent passage, but only as long as the regulations do not apply to design, construction, manning or equipment of foreign ships, unless State practice gives effect to GAIRS.<sup>36</sup>

The rules for determining the extent of a flag State's obligation and the coastal State's jurisdiction to prescribe technical measures for shipping in order to prevent marine pollution from the operation of ships are referred to in LOSC Article 211 as the GAIRS, which should be established by an international organisation such as the IMO.

Particular reference is made to '...pollution from or through the atmosphere...' in LOSC Article 212 for States to apply '...global and regional rules, standards and recommended practices and procedures to prevent, reduce and control such pollution....' This can apply to ship-source greenhouse gas emissions.

As there is no precise definition of the scope of the standards which GAIRS refers to, it can be assumed that GAIRS includes the LOSC and IMO's regulatory conventions such as MARPOL and SOLAS. This assumption is validated by the fact that these international conventions are truly global in nature with a significant number of global signatories and ratifications.

Flag States must comply with these GAIRS everywhere in the world. There should be no differentiation between ships of developed and developing States, except as LOSC Article 203 specifies, which says that the IMO should grant preference to developing States for financial, technical and operational services if they need it in order to prevent pollution of the marine environment. If a State has ratified one of the international conventions then national legislation must be prescribed incorporating and applying these international rules and standards to a State's own territorial jurisdiction.

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<sup>35</sup> LOSC, Part XII: art 197, 201, 211, 217-220, 226 and 228.

<sup>36</sup> RR Churchill and AV Lowe op cit note 29 at 347.

## Applicable International Rules and Standards (AIRS)

The enforcement of a State's jurisdiction is determined by LOSC Article 25 and 217, 218, 220 and 222 as mentioned earlier.

Article 25 and 220 give the coastal State the power, albeit limited, to interfere in the innocent passage of a foreign ship and investigate and instigate legal proceedings against ships passing through its territorial sea, which have violated the coastal State's AIRS. The AIRS not only refers to the applicable international law, but also the coastal State's nationally prescribed standards and regulations on the prevention of marine pollution from ships such as future legislation limiting greenhouse gas emissions.

The coastal State may not interfere with the innocent passage of a ship, but if the pollution caused by a ship in a coastal State's jurisdiction is '...wilful and serious...',<sup>37</sup> then the passage of the ship can obviously be considered to be non-innocent and the coastal State has unrestricted enforcement jurisdiction according to its national legislation.

Furthermore, according to LOSC Article 56 and 220, if a ship allegedly causes significant operational marine pollution within the exclusive economic zone (EEZ), which is in contravention of AIRS, then a coastal State through an authority, may take action to interfere in the passage of the ship and investigate the violation, and if necessary arrest the ship.

### 3.5 Flags of Convenience

An issue, which has emanated from the lack of legislative and enforcement jurisdiction under international law, is the topic of FOC. The main problem with international law in shipping is that it is too easy for ships to avoid having to comply with strict regulations and standards in one State by registering a ship in another State.

This is one important reason why a legal regime limiting ship-source greenhouse gas emissions should apply to all flags and not differentiate between flags from developed or Annex I nations, according to the UNFCCC, and those from the developing world ie Non-Annex I nations. Ship owners are entitled to

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<sup>37</sup> LOSC, art 19(2)(h).

register their ships under any flag as long as they can prove some degree of 'genuine link' as defined by the flag State.<sup>38</sup> Ship owners can therefore register their ships under flags which might be more lenient on certain regulations and standards, which essentially provide better economic opportunities for ship owners trading their ships under these so-called FOC.<sup>39</sup> Furthermore, when these FOC ships enter foreign territorial seas and ports it is not a simple process for the coastal State to interfere with the innocent passage of these ships especially on the open ocean. It is unlawful to board a ship without reasonable cause and evidence must be available that shows that a ship has violated the GAIRS or AIRS or any other international laws.<sup>40</sup>

If individual States introduced their own laws limiting ship-source greenhouse gas emissions, which are different from an international instrument then a potentially inconsistent mixture of regulations might develop across the world, which will certainly hamper effective global enforcement. A uniform international standard regulating ship-source greenhouse gas emissions is the only way forward to ensure one set of standardised rules are applied by flag and coastal States alike.<sup>41</sup>

Free market dynamics and competition should be encouraged in the shipping industry. However, FOC ships should never be allowed to compromise the protection of the marine environment from ship-source pollution, because certain standards on ships to prevent pollution such as limiting greenhouse gas emissions are not being fully met.

Finally, coastal State jurisdiction including its port State authority must be given sufficient powers of enforcement in matters related to limiting ship-source greenhouse gas emissions, which ships of all nations must obey.

China wants Non-Annex I countries to be exempted from any future obligations to have to limit greenhouse gas emissions from ships. China's view is supported by some other major Non-Annex I countries such as India and Saudi Arabia.<sup>42</sup>

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<sup>38</sup> LOSC, art 91(1).

<sup>39</sup> RR Churchill and AV Lowe op cit note 29 at 346.

<sup>40</sup> MARPOL 73/78, art 4 and LOSC, art 19.

<sup>41</sup> RR Churchill and AV Lowe op cit note 29 at 346.

<sup>42</sup> Sustainable Shipping News, 'IMO under pressure to act on emissions' (2008).

But the IMO opposes these views; the IMO Secretary General stated that, '...it seems completely incongruous that two ships, carrying similar cargo, loaded in the same port, sailing at the same speed and having the same destination, should be treated differently because they are registered under two different flags....'<sup>43</sup>

The USA also opposes the stance of China. They believe that exempting certain States would '...encourage ship owners to register in unregulated countries, undermining the goal of reducing emissions....'<sup>44</sup>

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<sup>43</sup> Ibid.

<sup>44</sup> Ibid.

## 4 CHAPTER FOUR: BEST PRACTICES

### 4.1 IMO Efforts to Limit Greenhouse Gas Emissions

On 9 April 2009 the *Second IMO GHG Study 2009, Final report covering Phase 1 and Phase 2* was completed. One of the main revisions in the updated study is an increase in the total ship-source emissions from a maximum 1.8 per cent of the global CO<sub>2</sub> (1996)<sup>45</sup> emissions to an estimated 3.3 per cent; this is the equivalent of 1,046 million tonnes of CO<sub>2</sub> (2007).<sup>46</sup>

IMO efforts on limiting and reducing ship-source greenhouse gas emissions were first realised in late 2003 when the IMO Assembly adopted Resolution A.963 (23) on *IMO Policies and Practices related to the Reduction of Greenhouse Gas Emissions from Ships*. This Resolution called for the development of a working plan with a timeline and milestones to be achieved in reducing greenhouse gas emissions, establishment of baselines for ship-source greenhouse gas emissions, develop a CO<sub>2</sub> Indexing Scheme, consider market-based and clean development mechanisms for the shipping industry and continue co-operating with the UNFCCC and the International Civil Aviation Organisation (ICAO). Similarly to the shipping industry the aviation industry was also left out of the UNFCCC and Kyoto Protocol.<sup>47</sup>

A chronology of the MEPC meetings following the adoption of IMO Resolution A.963 (23) on *IMO Policies and Practices related to the Reduction of Greenhouse Gas Emissions from Ships* is presented below and highlights the main developments and work carried out by the IMO dealing with greenhouse gas emissions from ships.

**MEPC 52:** October 2004. MEPC made headway on developing the draft Guidelines for the CO<sub>2</sub> Indexing Scheme. The Committee urged members to voluntarily apply the Scheme on a trial basis and report back at the next meeting on its success.

**MEPC 53:** July 2005. The MEPC approved the *Interim Guidelines for Voluntary Ship CO<sub>2</sub> Emission Indexing for Use in Trials*.

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<sup>45</sup> IMO, Study of Greenhouse Gas Emissions from Ships Issue no. 2 (31 March 2000) at 9.

<sup>46</sup> Second IMO GHG Study 2009 op cit note 4 at 10.

<sup>47</sup> Kyoto Protocol art 2(2).

**MEPC 54:** March 2006. A Working Group was formed, which would study issues surrounding the prevention of pollution from ships, especially actions relating to IMO Resolution A.963 (23) on IMO Policies and Practices related to the Reduction of Greenhouse Gas Emissions from Ships.

**MEPC 55:** October 2006. MEPC endorsed a work plan with a specified timeframe, which identified the need to develop mechanisms required to limit CO<sub>2</sub> emissions from ships.

**MEPC 56:** July 2007. A proposal by the Secretary-General of the MEPC was approved, which will study the impact of proposed marine fuel reductions in SO<sub>x</sub> and particulate matter (PM) on other emissions such as CO<sub>2</sub> emissions, taking into account available technologies for scrubbing out CO<sub>2</sub> from emissions.

The MEPC formed an Intersessional Correspondence Group, which will discuss ship-source greenhouse gas emissions.

The MEPC also requested an update of the IMO *Study on Greenhouse Gas Emissions from Ships* (2000). The report will be more in-line with current climate change issues and include the latest inventories on shipping's greenhouse gas emissions. The final updated report must be submitted to the MEPC at its 59<sup>th</sup> meeting in July 2009.

**MEPC 57:** April 2008. It was decided that the IMO has to present a position paper to the COP15 in December 2009, which is what was requested by the UN at the Bali Conference on Climate Change in December 2007.

The Working Group created a strategy for the development of short-term and long-term measures to address CO<sub>2</sub> emissions from ships.

The short-term measures include a proposal for a global levy scheme on marine fuel oil in order to reduce ship-source greenhouse gas emissions. Under this scheme, all ships engaged in international voyages would be subjected to a marine bunker levy, which is established at a set cost level per ton of marine fuel oil.<sup>48</sup>

Consequently, a baseline of marine fuel oil consumed and corresponding CO<sub>2</sub> emissions can be calculated. The prospect of a global levy scheme

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<sup>48</sup> IMO, 'IMO environment meeting adopts revised regulations on ship emissions' (2008).

contributing to greenhouse gas emission reductions from ships was found to be promising, although it was noted that several aspects would need to be worked on. These are the clarifications, which came out of the 57<sup>th</sup> meeting of IMO's MEPC: 31 March to 4 April 2008:<sup>49</sup>

- The practical implementation of a global levy scheme.
- Who would collect the levies and how?
- How would the revenues be distributed?
- The relation with existing environmental levies and tax regimes in general.
- Would there be enough clean development measures to buy credits?
- And the potential for a modal shift in transport at the regional level?

Other short-term measures listed include:<sup>50</sup>

- Improvement of specific fuel consumption.
- Energy Efficiency Design and Management Plan using a test mode for estimating the CO<sub>2</sub> index of newbuild ships.
- Onshore power supply.
- Use of wind power.
- Voluntary/mandatory requirements to report CO<sub>2</sub> index values, information exchange and rating performance of ships and operators.
- Strict limitations on leakage rates of refrigerant gases.
- Ship speed reductions.
- Measures to improve traffic control, fleet management, cargo handling operations and energy efficiency.

The longer-term measures identified by the Working Group and approved by the Committee for further development included:<sup>51</sup>

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<sup>49</sup> Ibid.

<sup>50</sup> Ibid.

- Technical measures for ship design.
- Use of alternative fuels.
- A CO<sub>2</sub> design index for new ships.
- External verification scheme for CO<sub>2</sub> operational index.
- Unitary CO<sub>2</sub> operational index limit, combined with penalties for non-compliance.
- ETS and/or CDM.
- Inclusion of mandatory CO<sub>2</sub> element in port infrastructure charging.

The MEPC 57 agreed with the measures presented by the Working Group and urged the shipping industry to adopt these measures.

**Intersessional Meeting in Oslo:** June 2008. This meeting developed a draft proposal for a future mandatory CO<sub>2</sub> design index and considered the interim CO<sub>2</sub> operational index for ships. The meeting further reviewed best practices for voluntary implementation measures for the operations of ships and found that if applied properly they could save substantial investment costs for new technology, but require co-operation with other stakeholders in order to succeed.

However, the draft CO<sub>2</sub> design index has already been criticised by Europe's shipyard industry.<sup>52</sup>

Secretary-General, Reinhard Luken, of the Community of European Shipyards' Association (Cesa) told maritime news service Lloyd's List: '...the point is that the [ship] builders are able to see the shortcomings [of the design index] and it will not serve our purpose... our feeling is that the issues with the design index are greatly underestimated... a mandatory design index as such will not sufficiently serve the purpose....' He added that '...market-based systems - such as a carbon trading scheme or a fuel levy would be a simpler way to assess CO<sub>2</sub> emissions... although those systems, too, had their own issues....'<sup>53</sup>

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<sup>51</sup> Ibid.

<sup>52</sup> Sustainable Shipping News, 'Problems with CO<sub>2</sub> Design Index' (2008).

<sup>53</sup> Ibid.

Alternatively, The International Chamber of Shipping (ICS) supports the development of a CO<sub>2</sub> design index and the ICS Marine Director Peter Hinchliffe is quoted below as saying: ‘...we want this to be mandatory so that the ships are delivered on an index scale... we should develop the formula and then spend two years testing against existing designs... this gives time to see what magnitude of efficiency can be delivered in the future. Before then we cannot see how we can drive down the index value....’<sup>54</sup>

However, the MEPC has the final say in what guidelines will be implemented.

**MEPC 58:** October 2008. At the 58<sup>th</sup> session of the MEPC, which were held at the IMO's headquarters in London, the MEPC adopted revisions to the MARPOL Annex VI regulations to further reduce harmful emissions from ships. One of the main revisions to MARPOL Annex VI is a gradual reduction in SO<sub>x</sub> emissions from ships. The global SO<sub>x</sub> will be reduced to 3.50 per cent to begin with from the present 4.50 per cent and this will take effect from 1 January 2012. Thereafter, SO<sub>x</sub> emissions will be capped to 0.50 per cent effective from 1 January 2020, however, this will be subject to a feasibility study, which should be completed by 2018. The cap on SO<sub>x</sub> emissions in SECAs will be reduced from 1.50 per cent at present to 1.00 per cent by 1 July 2010 and to 0.10 per cent by 1 January 2015.<sup>55</sup>

Another of the main revisions to MARPOL Annex VI is the reductions in NO<sub>x</sub> emissions from ships. The most stringent controls will be placed on Tier III marine engines ie those engines installed on ships constructed on or after 1 January 2016 and which operate in the Emission Control Areas (ECAs). The revised MARPOL Annex VI caters for ECAs to be designated for SO<sub>x</sub>, PM and NO<sub>x</sub> or any combination of all three types of emissions from ships. The establishment of an ECA for either three emission types is dependent upon the submission of a proposal by a Party or more than one Party who are members of MARPOL Annex VI. The proposal would then be considered for adoption by the IMO if it sufficiently highlights the need for limiting SO<sub>x</sub>, NO<sub>x</sub> and particulate matter or all three from ships in a designated ECA.<sup>56</sup>

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<sup>54</sup> Ibid.

<sup>55</sup> IMO, ‘IMO environment meeting adopts revised regulations on ship emissions’ (2008).

<sup>56</sup> Ibid.

The revised MARPOL Annex VI will enter into force on 1 July 2010 with tacit acceptance.<sup>57</sup>

The MEPC also revised the NO<sub>x</sub> Technical Code to include a new chapter on the best approach for NO<sub>x</sub> regulation of marine engines built before 2000. The new NO<sub>x</sub> Technical Code requires marine engine measurement and monitoring methods, a certification procedure for existing engines and test cycles to be applied to Tier II and Tier III marine engines.<sup>58</sup>

The revised MARPOL Annex VI also includes updated guidelines for exhaust gas cleaning systems and guidelines for the development of a VOCs management plan.<sup>59</sup> Furthermore, the revised MARPOL Annex VI states that all ships shall keep an inventory of equipment containing ozone-depleting substances and every ship over 400 GT that has rechargeable systems must maintain an Ozone-Depleting Substances Record Book.<sup>60</sup> These procedures were developed in order to facilitate proper monitoring and management of ozone-depleting substances, which in the future could be done for all greenhouse gases emitted from ships.

The IMO says that the, '...revised MARPOL Annex VI measures are expected to have a significant beneficial impact on the atmospheric environment and on human health, particularly that of people living in port cities and coastal communities....'<sup>61</sup>

The MEPC Committee also endorsed the draft interim guidelines for CO<sub>2</sub> design and operational indices for new ships. The Committee discussed market-based mechanisms for reducing greenhouse gas emissions from ships, but agreed that this topic will be finalised at MEPC 59. The debate continued surrounding the UNFCCC principle of 'common but differentiated responsibilities' versus the 'global mandate' of the IMO regulatory framework on greenhouse gas emissions applicable to all flags.<sup>62</sup>

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<sup>57</sup> IMO tacit acceptance procedure: The amendments enter into force six months after the deemed acceptance date, 1 January 2010, unless within the acceptance period an objection is communicated to the Organization by not less than one third of the Parties or by the Parties the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world's merchant fleet.

<sup>58</sup> IMO op cit note 55.

<sup>59</sup> Ibid.

<sup>60</sup> Second IMO GHG Study 2009 op cit note 4 at 52.

<sup>61</sup> IMO op cit note 55.

<sup>62</sup> Sustainable Shipping News op cit note 42.

Nearly 80 per cent of the world's merchant fleet deadweight tonnage is currently flagged in Non-Annex I developing countries, see Table 2 in the Appendix.<sup>63</sup> Therefore, the majority of the world's merchant fleet by deadweight tonnage are flagged under Non-Annex I countries.

**Intersessional Meeting in London:** March 2009. The IMO's working group on greenhouse gas emissions from ships held an intersessional meeting at the London headquarters from 9 to 13 March 2009. Significant ground was covered in developing policies and measures to improve energy efficiency in shipping and consequentially limit greenhouse gas emissions.

The working group consists of more than 200 international specialists focused on the technical and operational measures to reduce greenhouse gas emissions from ships ie two of the three so-called pillars of IMO's ship-source greenhouse gas emissions work. The third pillar is market-based mechanisms, which was discussed at the MEPC 59 in July 2009.<sup>64</sup>

The main focus of the meeting was to refine the Energy Efficiency Design Index (EEDI) for new ships based on the results of voluntary experiments over the last six months, which used the EEDI.<sup>65</sup> The EEDI is an index, formerly known as the CO<sub>2</sub> design index, which measures the relative ship energy performance or fuel efficiency of a new ship during its design stage. The energy output of a ship is proportional to the quantity of CO<sub>2</sub> or greenhouse gas emissions. Therefore, the EEDI is a measure of the greenhouse gas emissions from ships in relation to their value or benefit to society.<sup>66</sup> The EEDI allows for different parameters such as the fuel efficiency of different ship designs, or a specific design, but with different inputs such as speed, type of propeller (fixed or variable pitch) or the use of waste heat recovery systems. The EEDI will contain a required minimum level of fuel efficiency based on the performance of a reference ship, which will be established based on the average fuel efficiency for ships delivered between 1995 and 2005.<sup>67</sup>

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<sup>63</sup> IMO, 'Latest GHG Considerations within IMO - Outcome of the fifty-eighth session of Marine Environment Protection Committee', 16 to 18 February 2009 at 4. In accordance with Lloyd's Register Fairplay's database, as at 1 March 2008.

<sup>64</sup> IMO, 'March 2009: Second intersessional meeting of IMO's Working Group on Greenhouse Gas Emissions (GHG) from Ships' (2009).

<sup>65</sup> Ibid.

<sup>66</sup> David Anink and Marnix Krikke 'The IMO Energy Efficiency Design Index - A Netherlands Trend Study' January (2009) Centre for Maritime Technology and Innovation (CMTI) at 4.

<sup>67</sup> IMO op cit note 55.

Research has indicated that the calculations of the EEDI are not necessarily suitable for special ships like dredgers and offshore construction and pipelay ships, because these types of ships have a different purpose to most other ships such as tankers and container liners and they move slowly during operations or have to maintain dynamic positioning in one place. Therefore, an EEDI formula specific to each type of ship should be developed including the parameters which determine its greenhouse gas emissions and relative benefit or impact on the environment and society.<sup>68</sup>

The working group also discussed how to improve the Energy Efficiency Operational Index (EEOI). While the EEDI measures the energy efficiency of a new ship, the EEOI enables ship operators to measure the fuel efficiency of an existing ship and can therefore monitor the performance of ships and the effectiveness of any measures adopted to reduce energy consumption. The EEOI has been applied by member States and the shipping industry, on a trial basis since 2005 to hundreds of ships. The efficiency of a specific ship is expressed in terms of grams of CO<sub>2</sub> emitted per tonne mile, which enables comparisons of its energy or fuel efficiency to similar ships.<sup>69</sup>

The draft Ship Energy Management Plan (SEMP) was also discussed in the intersessional meeting. Essentially, the draft SEMF includes guidelines on best practices for reducing energy consumption on ships, improved voyage planning, speed and power optimisation, optimised ship handling, and improved fleet management and cargo handling, as well as energy management for individual ships.<sup>70</sup>

Finally, the IMO hopes that the progression towards a more complete and refined EEDI and EEOI will also lead to future technical developments which will improve the energy efficiency of new and existing ships and could also generate ideas for future design blueprints of green, energy efficient ships.<sup>71</sup>

**MEPC 59:** 13 to 17 July 2009. This MEPC meeting discussed voluntary technical and operational measures as well as market-based mechanisms to reduce greenhouse gas emissions from ships. The market-based policies discussed in the meeting should incentivize ship owners to get involved in applying

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<sup>68</sup> David Anink and Marnix Krikke op cit note 66 at 3.

<sup>69</sup> IMO op cit note 55.

<sup>70</sup> Ibid.

the agreed measures on a voluntary trial basis. The outcomes and results from these trial runs will then be presented to the MEPC 60 in March 2010.

An agreed working plan was developed for initiating the implementation of the measures discussed in this MEPC 59 session and will be further refined at other meetings in the future with the intention of finalising a legal regime for limiting ship-source greenhouse gas emissions.<sup>72</sup>

The measures discussed in the MEPC 59 include:<sup>73</sup>

1. Provisional methodologies for calculating ship-source greenhouse gas emissions.
2. Voluntary trials of the EEDI for new ships, which the Committee hopes will encourage ship owners and industry to invest in technological research and development for improving the energy efficiency and emission reductions in newbuild ships.
3. Development of a SEMP for new and existing ships which is focused on the implementation of technical and operational best practices in shipping for reducing energy consumption, improving fuel efficiency and ultimately reducing greenhouse gas emissions.
4. Plans for using the EEOI for new and existing ships, which enable operators to measure and monitor the fuel efficiency of a ship and calculate the effectiveness of any measures adopted to reduce energy consumption.

The Committee has indicated that it supports the generation of funds created by implementing the policies of market-based mechanisms for limiting greenhouse gas emissions. It also noted that these funds are to be managed by the IMO and used for mitigating climate change in Non-Annex I (developing) countries through existing or new funding mechanisms under the UNFCCC or other international organisations.<sup>74</sup>

The next MEPC meeting is the MEPC 60 in March 2010. However, before then the Committee will continue to develop the action plan, which has come out

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<sup>71</sup> Ibid.

<sup>72</sup> IMO, 'IMO environment meeting issues technical and operational measures to address GHG emissions from ships' (2009).

<sup>73</sup> Ibid.

of this MEPC 59. The Committee will then present the action plan for incorporating the shipping industry into an acceptable legal regime for limiting ship-source greenhouse gas emissions at the upcoming COP 15 in December 2009 and will take note of and include any relevant outcomes from COP 15.<sup>75</sup> The COP 15 will attempt to determine a post Kyoto Protocol climate change regime to follow on from the current Kyoto Protocol, which expires at the end of 2011.

Most significantly the Committee favours the development of a legal regime for limiting ship-source greenhouse gas emissions, which should be enacted by the IMO as the most competent international body for the shipping industry.<sup>76</sup>

#### **4.2 Market-based Mechanisms**

The operating costs to run a ship are high at the moment, fuel prices are expensive, crewing is expensive, insurance premiums have increased and the global economy is going through one of its worst recessions ever. It is understandable then that the shipping industry, which is generally known to be conservative, does not embrace the idea of having to add to its costs in order to make it more environmentally friendly. Without any real incentive to invest in new environmentally friendly technologies, the shipping industry has fallen behind other land based industries with respect to developing climate change policies and instruments to improve its environmental performance. A future legal regime for limiting ship-source greenhouse gas emissions must therefore incorporate into its framework market-based mechanisms, which will encourage the shipping industry to limit its greenhouse gas emissions.

The IMO *Study on Greenhouse Gas Emissions from Ships (2000)* provides some policies that could be useful to limiting ship-source greenhouse gas emission; these are summarised in Table 3 in the Appendix. In general, the outcomes of the IMO *Study on Greenhouse Gas Emissions from Ships (2000)* for policies to incentivize greenhouse gas emission reductions from ships are pessimistic. This is especially evident when one considers the present high fuel prices and the savings, which ship owners could benefit from by operating their ships more efficiently and investing in technologies, which could improve the energy efficiency of the ship. These measures can be taken voluntarily; or rather

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<sup>74</sup> Ibid.

<sup>75</sup> Ibid.

<sup>76</sup> Ibid.

they could be enforced through prescribed legislation and standards, such as MARPOL Annex VI with a chapter specifically on limiting greenhouse gas emissions, which covers standards and measures to be implemented, which will reduce greenhouse gas emissions and be cost effective.

Note that voluntary agreements cannot be solely relied upon as a key mechanism for bringing about any significant changes in limiting ship-source greenhouse gas emissions. Voluntary policies are fine for initiating developments in the shipping industry to limit greenhouse gas emissions where little or no such legislation exists, which is the case at the moment, but if a global instrument on limiting greenhouse gas emissions is to be effective and efficient then voluntary agreements are not the solution.

In the future ship owners could be allowed to earn carbon credits for their efforts to reduce greenhouse gas emissions below a set baseline or threshold. There would be a strong incentive for ship owners to reduce their greenhouse gas emissions especially if they can make money by selling carbon credits in an international maritime emissions trading exchange. A baseline is a maximum reference point, or a starting scenario, from which appropriate action must be taken to reduce greenhouse gas emissions.<sup>77</sup>

The opportunity exists in the future for ship owners to earn carbon credits for going beyond the design requirements and standards in order to reduce greenhouse gas emissions in newbuild ships. It is suggested in the IMO *Study on Greenhouse Gas Emissions from Ships (2000)* that the limit of carbon emissions for newbuild ships, which are designed to meet the necessary emission targets to mitigate climate change, as laid down by the UNFCCC, should form the baseline for all newbuild ships. If there is an incentive for ship owners to exceed these standards and potentially earn carbon credits for their costs and efforts then this concept could become a viable instrument for earning credits and being rewarded for exceeding the set baseline. This will encourage further research and development in technological measures to enhance the reduction of greenhouse gases from ships.

The downside of this is that baseline setting can become more difficult and complicated to calculate. When you apply the concept of a baseline or cap to

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<sup>77</sup> IMO Study on Greenhouse Gas Emissions from Ships (2000) op cit note 45.

existing ships the baseline or maximum reference point of emissions from that ship will have to be periodically revised as the ship improves its technological and operational measures to reduce greenhouse gas emissions. As a ship owner invests more and more in technological or operational measures to reduce a ship's carbon emissions the energy efficiency and consequently the carbon emissions will also decline. If the allocation of carbon credits is calculated on an annual basis for example then it could be suggested that each year a ship's emission counter is reset and whatever quantity below its previous baseline the ship achieves the more carbon credits it will be awarded.

Ideally the ship will reach a point one day which is the absolute minimum amount of greenhouse gases, which can be emitted, without actually being totally carbon neutral. Indeed, carbon neutrality is also a goal for the shipping industry to work towards. However, until a suitable and cost effective alternative to marine fuel oil is developed, which will be available on a large scale such as marine fuel oil is today then it is highly unlikely that the entire shipping industry can become carbon neutral.

If the ship owner wants to invest in and develop technology for the shipping industry, which will reduce emissions then these projects if successfully verified and certified can become a CDM project, which can be traded. Credits from the shipping industry could then be included in an international emission trading exchange, which will be fully compatible with the fundamental principles of the UNFCCC as well as the stated objectives of the Kyoto Protocol.

The IMO will need to satisfy the UNFCCC that its greenhouse gas reduction regime will contribute meaningfully and sustainably to combating climate change. Furthermore the IMO will have to prove that it has the resources and capability to manage a climate change regime for the shipping industry. It will have to develop a legal framework for dealing with some of the features already discussed above such as establishing baselines, monitoring emissions, verifying and certifying carbon credits and CDM / JI projects.<sup>78</sup>

The difficulty of executing these types of emission credit sales and emission cap and trade policies is one of the biggest challenges in developing a workable market-based mechanism for the shipping industry. The mechanisms discussed

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<sup>78</sup> Ibid.

above are essentially the biggest stumbling block for following a path as laid out by the UNFCCC and the Kyoto Protocol to limit greenhouse gas emissions from ships, which is why the shipping industry was not included in the Kyoto Protocol.

The shipping industry is a global and highly complex industry; it cannot operate on a simple method of allocating emission quotas based on their source as land-based industries do. The shipping industry is one of the biggest industries in the world and it is global (shipping is responsible for 90 per cent of the world trade) and finally it is a highly political and complex industry. Therefore it is not possible to take such a complicated and global industry and simply differentiate out the responsibilities of States towards limiting greenhouse gas emissions. This is the underlying argument why the shipping industry cannot be incorporated into a legal regime, which covers the shipping industry within the UNFCCC framework. It simply will not work.

An effective and efficient solution is to develop a legal regime within the IMO through an existing convention, which is well established and globally recognised such as MARPOL Annex VI, which will include technical as well as operational measures similar to those developed for SO<sub>x</sub>, NO<sub>x</sub>, VOCs and CFCs. The chosen market-based instruments can also be included and the emissions targets set by the shipping industry will be consistent with those dictated by the UNFCCC and future Kyoto Protocols, but it will be managed by the IMO and its members within its own workable framework.

There are two key market-based mechanisms, which the IMO believes are suitable for inclusion in a legal framework which encourages the reduction of greenhouse gases from the shipping industry. Currently, the two choices of market-based instruments consist of: a Maritime Emissions Trading Scheme (METS) and an International Compensation Fund (ICF) for greenhouse gas emissions from ships. The METS raises funds by auctioning or trading carbon credits and emission allowances and the latter fund is based on revenue accumulated by imposing a global levy (tax) on marine bunker fuels.<sup>79</sup>

These two market-based instruments share a number of similar features:<sup>80</sup>

1. Both instruments can function on the required global scale to all ships.

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<sup>79</sup> Second IMO GHG Study 2009 op cit note 4.

<sup>80</sup> Ibid.

2. Both instruments would however, raise costs, thus creating an additional incentive to improve the fuel efficiency of each ship.
3. Both instruments would need to be managed by the IMO.
4. Both instruments would raise funds to reduce greenhouse gas emissions, especially the global bunker levy. However, raising funds is not the main function of an emission trading scheme, although it is an incentive.

The characteristics of ICF are as follows:<sup>81</sup>

1. Shipping would become subject to a levy/tax on all types of marine bunker fuels, which will determine the unit cost per tonne of fuel.
2. The levy can be paid by the ship, or the bunker suppliers, or by the original fuel oil refiners. Even ships flagged by States who are not party to the ICF will be charged the levy on bunkers taken by the relevant port State control. Suppliers of bunkers from States which are non-members to the ICF do not have to pay the levy, but the ships which take bunker in these States will still have to pay the levy, which will be enforced by the relevant flag and port State control.
3. An organisation such as the IMO will monitor each ship in the global fleet and account for all the bunkers and bunker levies paid. In case of port State control inspections a ship will have a copy of the receipts for payments made toward the global bunker levy.
4. The proceeds from the payments of the bunker levies will be sent to an International Maritime Greenhouse Gas Emissions Fund and will be managed by an organisation such as the IMO.
5. Guidelines will be established, which dictate how the funds will be used. The ICF could allocate the money appropriately in order to meet the various greenhouse gas emission reduction targets such as purchasing emission allowances from other industries for example CDM or JI projects. Funds received could also be invested in research and development in the shipping industry or contribute towards an IMO Technical Cooperation Programme to improve the energy efficiency of ships.

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<sup>81</sup> Ibid.

The characteristics of METS are as follows:<sup>82</sup>

1. This market-based instrument for limiting greenhouse gas emissions is global and applies to all ships over a certain size, such as 400 GT, as per MARPOL Annex VI. In the future if changes are necessary to the instrument in order to sustain its effectiveness then these would be allowed, which is consistent with the revisions in MARPOL.
2. METS will set a limit on global maritime emissions, which will be based on historical data of shipping emissions. Targets of emission reductions will also be set, which will be in line with the requirements of the UNFCCC and the findings of the IPCC. As this involves greenhouse gas emissions from ships it makes sense that the cap and targets should be established and managed by an appropriate international organization such as the IMO bearing in mind the expectations of the UNFCCC to mitigate climate change as quickly as possible.
3. Ships which are members of METS will trade emission allowances with other ships within the scheme. However, the scheme allows trade to be carried out with other carbon trading exchanges. This enables the shipping industry to trade emission allowances with other industries, which means that the shipping industry could reduce its emissions at a lower marginal price than investing in abatement measures. Furthermore, by increasing the number of industries and companies involved and exposed to METS the scheme will become less sensitive to price volatility, which should encourage trade. METS will be able to assist developing countries to meet their targets for mitigating climate change by allowing the purchase of CDM / JI credits from developing countries.
4. The ship will be the entity responsible for monitoring emissions and managing the reporting of emissions to the relevant authorities and surrendering their allowances. Therefore the onus is on the ship and its management to make sure that it is compliant with regulations which would guide METS. Obviously the ship and its crew cannot themselves trade allowances. This of course is left to the ship owners and operators and other responsible parties to manage and ensure the correct contractual and legal

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<sup>82</sup> Ibid.

arrangements are in place for trading allowances. It will be mandatory for the ships to monitor their fuel consumption in a verifiable way such as EEDI and EEOI for new and existing ships, respectively.

5. It is the responsibility of a ship to report its annual emissions to the flag State and to make its emission allowances known. Ships flying the flag of non-members to the Convention will still be allowed to trade any of their carbon emission allowances with other ships or entities. Port States should inspect whether or not ships have traded allowances.
6. Some of the options available for trading emission allowances for each ship are as follows: selling / auctioning allowances, or free allocation (depending on the previous emissions of a ship / previous emissions baseline) and finally a combination of either of them.
7. Proceeds from the emissions trading can be used to support developing countries in their efforts to mitigate climate change and contributions can be made towards research and development in the shipping industry.
8. An administrative organisation for example an entity within the IMO would have to be established to manage METS.

The proposed IMO market-based mechanisms would both raise money for an international compensation fund to reduce greenhouse gas emissions. The main difference between the ICF and METS is how the funds are raised. The METS funds are received by selling emission allowances and the ICF receives its income from the levy on marine bunker fuels.<sup>83</sup>

Both METS and the ICF seem to be cost-effective market-based mechanisms, which have the potential to reduce greenhouse gas emissions from ships. Both instruments cater for large amounts of emissions within their scope. They allow for all types of technical and operational measures in the shipping industry to be used. They both need the functions of a global organization, which can handle the scale and scope of administration required, such as the IMO. METS has a positive effect on improving the environment as it inherently seeks to reduce emissions. On the other hand the ICF does not have an immediate effect on bettering the environment and reducing emissions until its funds are invested in

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<sup>83</sup> Ibid.

purchasing carbon credits. Finally, both schemes provide incentives to encourage investment in technological and operational measures to limit ship-source greenhouse gas emissions.<sup>84</sup>

### 4.3 Global but Differentiated Responsibilities

The UNFCCC calls for 'common but differentiated responsibilities'<sup>85</sup> from countries in order to equitably mitigate climate change. However, considering that shipping is such a complex and global industry it is difficult to simply differentiate between ships from the developed worlds (Annex I and II) and ships from the developing world (Non-Annex I). In order for the shipping industry to be effectively managed it is essential that IMO regulations such as MARPOL Annex VI apply globally to all shipping nations irrespective of whether or not the flag State is considered to be a developed or developing nation.

UNFCCC Article 3(1) – The 'common but differentiated responsibilities' principle:

The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof.

A legal framework for limiting ship-source greenhouse gas emissions should find a balance between a global all encompassing agreement and one that differentiates responsibilities for limiting these emissions. Dr. Andre Stochniol founder of the International Maritime Emission Reduction Scheme (IMERS) in 2006 has decided to dedicate his business and career to finding solutions to the problems of climate change.<sup>86</sup> Dr Stochniol advocates for a global but differentiated principle for international shipping and climate change, which is based on the following:<sup>87</sup>

1. In order to incentivize combating greenhouse gas emissions from ships a market-based instrument should be developed, which is both global, as required by the IMO, and differentiated as required by the UNFCCC.

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<sup>84</sup> Ibid.

<sup>85</sup> UNFCCC Article 3(1).

<sup>86</sup> Andre Stochniol 'A Global Differentiated Scheme to Reduce Maritime Carbon Dioxide Emissions' (2008) International Maritime Emissions Reduction Scheme (IMERS) London.

<sup>87</sup> Ibid.

2. Such a global but differentiated principle is only applicable to market-based schemes and instruments and it does not apply to technical and operational measures.
3. The policy is based on differentiating the cargo imported by the flag State of the ship.
4. The destinations are only defined as Annex I countries or Non-Annex I countries.
5. The countries of destination are dealt with as per the UNFCCC ie Annex I destinations are fully included and Non-Annex I destinations are excluded.
6. Where there is a mixture of cargo for Annex I and Non-Annex I destinations then greenhouse gas emissions are proportioned out according to the ship's share of goods unloaded in Annex I countries or destined to Annex I countries for transhipments.

The advantages to this proposed policy of global but differentiated responsibilities to limiting ship-source greenhouse gas emissions are as follows: the policy will meet the requirements of the nine principles proposed at the MEPC 57, see below, whereby the IMO called for a global approach to limiting greenhouse gas emissions and it also meets the requirements for 'differentiated responsibilities', which are required by the UNFCCC.

One of the most significant outcomes of the MEPC 57, April 2008, was the development of nine fundamental principles for a future IMO framework for limiting ship-source greenhouse gas emissions, which are as follows:<sup>88</sup>

1. Effective contribution to the reduction of total global greenhouse gas emissions.
2. Binding and equally applicable to all flag States in order to avoid evasion.
3. Cost-effective.
4. Able to limit, or at least, effectively minimise competitive distortion.

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<sup>88</sup> IMO op cit note 1.

5. Based on sustainable environmental development without penalising global trade and growth.
6. Based on a goal-based approach and not prescribe specific methods.
7. Supportive of promoting and facilitating technical innovation and research and development in the entire shipping sector.
8. Accommodating to leading technologies in the field of energy efficiency.
9. Practical, transparent, fraud free and easy to administer.

Amending the IMO's MARPOL Annex VI to include a chapter on limiting greenhouse gas emissions is the most logical process for developing a ship-source greenhouse gas emissions legal regime as soon as possible. MARPOL Annex VI is already a global instrument applicable to all ship types and sizes. It can stipulate the required technical and operational measures and a new section on market-based mechanisms for limiting greenhouse gas emissions can be included, which cover the most appropriate schemes for encouraging the shipping industry to reduce its impact on greenhouse gas emissions. The introduction of market-based instruments, which are global, but differentiated in responsibilities, would comply with climate change requirements in the UNFCCC.

The UNFCCC's Subsidiary Body for Scientific and Technological Advice has been battling with how they should assign emissions to the international shipping industry. Assigning bunker fuel emissions to a country is especially difficult considering that shipping is a globally complex industry with more than 80 per cent of the world's merchant fleet deadweight tonnage flying the flag of developing or UNFCCC Non-Annex I countries, see Table 2 in the Appendix.<sup>89</sup> Therefore, the majority of the world's merchant fleet are flagged under Non-Annex I countries. According to the UNFCCC's Subsidiary Body for Scientific and Technological Advice there are several options available for allocating 'marine bunker fuel' emissions:<sup>90</sup>

1. No allocation.

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<sup>89</sup> IMO op cite note 63.

<sup>90</sup> Sven Bode et al 'Climate Policy: Analysis of ecological, technical and economic implications for international maritime transport' (2002) 4 *International Journal of Maritime Economics* at 9-12.

2. Allocation of bunker emissions to Parties in proportion to national emissions.
3. Allocation to Parties according to the country where the bunker fuel is sold.
4. Allocation to Parties according to the nationality of the transporting company, the country where the ship is registered, or the country of the operator.
5. Allocation to Parties according to the country of departure or destination. Alternatively the emissions related to the journey could be shared between the country of departure and the country of arrival.
6. Allocation to Parties according to the country of departure or destination of passenger or cargo. Alternatively, the emissions related to the journey of a passenger or cargo could be shared by the country of departure and the country of arrival.
7. Allocation to parties according to the country of origin of the passenger or owner of the cargo.
8. Allocation to the Party of emissions generated in its national space.

However, this dilemma can be answered by amending the IMO's MARPOL Annex VI to include a section on market-based mechanisms for limiting ship-source greenhouse gas emissions, as per Dr. Stochniol's global, but differentiated principle. A global and common but differentiated policy on limiting greenhouse gas emissions from international shipping is viable and necessary for the successful implementation of such a legal regime. The relevant international laws and precedents already exist, which can be utilised and amended as required, especially the IMO's MARPOL Annex VI.

#### 4.4 Technical and Operational Measures

In September 1997, when the MARPOL Annex VI Protocol was approved it included Resolution 8, which covered CO<sub>2</sub> emissions from ships and called for the IMO to co-operate with the UNFCCC. A *Study on Greenhouse Gas Emissions from Ships* was completed by the 45<sup>th</sup> MEPC meeting in October 2000 and finally the IMO considered a feasible ship-source greenhouse gas emissions reduction strategy for the future.

The IMO *Study on Greenhouse Gas Emissions from Ships* (2000) produced some of the following conclusions:<sup>91</sup>

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<sup>91</sup> IMO Study on Greenhouse Gas Emissions from Ships (2000) op cit note 45.

- There are substantial reductions of greenhouse gas emissions, which can be achieved by implementing improved ship operational measures eg reducing the speed of a ship by 10 per cent on average will decrease CO<sub>2</sub> emissions by 23.3 per cent.
- Policy and regulations effectively pave the way for the development of technical changes required for new ship designs in order to reduce greenhouse gas emissions such as CO<sub>2</sub>. New policies also force manufacturers and ship managers to make general changes to existing engines, hulls and propellers in order to improve ship performance and make the ships more energy efficient.
- Shipping is generally regarded as the most environmentally friendly mode of transport and therefore it forms an integral part of domestic and international environmentally sustainable transport systems.

However, the shipping industry has been slow to develop and implement measures to limit ship-source greenhouse gas emissions, mainly due to the fact that the industry is so global and politically complex. Mobilising the necessary will power and consensus to create a global legally binding regime is going to be difficult. However, as this minor dissertation has shown, there are ways and means to do it especially within the framework of an amended MARPOL Annex VI. It is suggested that a new chapter on limiting ship source greenhouse gas emissions be added to MARPOL Annex VI, which includes the technical and operational measures necessary for reducing greenhouse gas emissions.

The following discussion outlines the main technical and operational measures necessary for limiting greenhouse gas emissions from ships and provides some policies, which could incentivize the shipping industry to use them.

According to the *Second IMO GHG Study 2009* there are four basic categories of technical and operational measures for limiting greenhouse gas emissions from ships:<sup>92</sup>

1. Improve energy efficiency for both new and existing ships.
2. Use renewable energy sources eg wind and solar power.

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<sup>92</sup> Second IMO GHG Study 2009 op cit note 4.

3. Use alternative fuels such as biofuels and liquefied natural gas (LNG), which have low levels of greenhouse gas emissions.
4. Use emission-reduction technologies.

Research has shown that by combining a variety of technical and operational measures, greenhouse gas emissions from ships could be reduced by 25 to 75 per cent.<sup>93</sup> Therefore, developing a legal regime and implementing instruments to limit greenhouse gas emissions from ships can add to internationally cost-effective emission reductions.

The market-based mechanisms discussed earlier such as the international maritime emissions scheme and carbon credit trading should also provide sufficient incentive for ship owners to invest in technological developments.

Alternatively imposing mandatory technical standards and regulations on the shipping industry to limit greenhouse gas emissions will also lead to the enforcement of these measures. However, enforcing technical standards now can backfire in the future as they do not necessarily encourage new research and technological development. Technical standards should be periodically assessed and revised if need be in order to keep up to date with developments.

Currently, there are many technical measures to improve the performance of an existing ship and reduce the amount of CO<sub>2</sub> emitted. The measures vary from carrying out proper maintenance on the ship's hull and propeller to reduce as much drag as possible. Excess marine growth on the hull or damage to the propeller can cause a significant increase in fuel economy. Using alternative fuels such as LNG or fuels such as diesel with low carbon ratios can also significantly reduce emissions. Table 4 in the Appendix provides a summary of some of the individual technical measures proposed in the IMO *Study on Greenhouse Gas Emissions from Ships* (2000), which can be applied to existing ships and their corresponding potential to reduce greenhouse gas emissions from ships.

During the design stage of new ships there is a huge opportunity to develop new and environmentally friendly concepts for ships and technology, which can significantly reduce greenhouse gas emissions such as optimally designed hull shapes and propeller types, which ensure that the hydrodynamics of the ship are

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<sup>93</sup> Ibid.

as effective as possible making the ship fuel efficient from the outset. Table 5 in the Appendix provides a summary of some of the individual technical measures proposed in the IMO *Study on Greenhouse Gas Emissions from Ships* (2000), which can be applied to newly designed ships with the corresponding potential there for reducing greenhouse gas emissions.

There are numerous technical measures, which can be used to improve the performance of a ship and its fuel economy and a combination of measures together would produce the best potential for reducing emissions. When fuel oil prices are high it is especially viable to implement these measures as they have shown to be significantly cost effective. It is probably best to include a variety of different technical measures in the legal instrument, which ship operators can choose.

Operational measures to limit greenhouse gas emissions can be put into practice during the running of a ship. Operational measures take into account the practices carried out by ship operators, ship management companies, individual ships and their crew. By improving the running of a ship one can reduce the amount of energy used by the ship and consequently limit the amount of CO<sub>2</sub> ie greenhouse gases emitted. The IMO *Study on Greenhouse Gas Emissions from Ships* (2000) examined and quantified the potential for reducing greenhouse gas emissions by implementing more efficient and effective ship operations.

Some of the operational measures, which can be used to reduce greenhouse gas emissions from ships, are as follows:<sup>94</sup>

- Slow steaming: reducing a ship's speed can reduce greenhouse gas emissions by 40 per cent.
- Weather routing: a reduction of 2 to 4 per cent in greenhouse gas emissions is possible by following the optimal route and avoiding bad weather and sea conditions.
- Optimising operating parameters: by sailing at steady power with minimal RPM variations, optimal trim and propeller pitch, minimum ballast and optimal rudder with minimum course deviation results in a 1 to 5 per cent reduction in greenhouse gas emissions.

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<sup>94</sup> IMO Study on Greenhouse Gas Emissions from Ships (2000) op cit note 45.

- Reduced time in port: more efficient cargo handling and more efficient anchoring can reduce greenhouse gas emissions by 1 to 7 per cent.

Once again market-based mechanisms for limiting greenhouse gas emissions will provide the incentives to implement all the operational measures mentioned above. For example, during the early 1980s, when oil prices were at record highs ships sailing at reduced speed were reported to have reduced energy consumption by 10 to 20 per cent.<sup>95</sup>

Ship owners and managers have proposed the idea that investments in technology for their ships, which reduce greenhouse gas emissions, should be considered as CDM mechanisms. This is based on the UNFCCC guidelines for CDM mechanisms, discussed earlier, which indicate that investments in technical installations which directly limit greenhouse gas emissions such as switching to biofuels or investing in more energy efficient equipment are acceptable. However, there is still doubt as to whether or not operational measures, which limit greenhouse gas emissions from ships, should be considered as CDM mechanisms for the purposes of carbon credit trading. The only exception in this case could be maintenance measures taken in the operation of ship, which could be verifiable. In terms of cost, it is likely that most operational measures could be introduced at a relatively low cost, which will lead to better energy efficiency and cost savings.

According to the *Second IMO GHG Study 2009* and the outcomes from the MEPC 57, MEPC 58 and the intersessional meeting recently held in London in March 2009, it is evident that the IMO favours the development and eventual implementation of a CO<sub>2</sub> monitoring system, which will be known as the EEDI for new ships and the EEOI for existing ships. The *Second IMO GHG Study 2009* concludes that setting a compulsory requirement to use EEDI for new ships will save costs and thus provide an incentive for ship owners to limit their emissions. The downside is that the EEDI only concerns new ships and only during their design stage and not during operations. Consequently, the EEDI does have its limitations as a viable instrument for reducing emissions, but it is an important tool to have and in my opinion should be included in the legal framework for limiting greenhouse gas emissions from ships.<sup>96</sup> With respect to the existing ships the

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<sup>95</sup> Ibid.

<sup>96</sup> Second IMO GHG Study 2009 op cit note 4.

application of the EEOI also seems to be a cost-effective solution, which provides a good incentive for ship owners to operate their ships as efficiently as possible in order to keep their allowable emissions below the baseline. This could encourage ship owners to invest in new technologies and operational measures. As discussed earlier the challenge lies in calculating the baseline and setting new emission reduction targets, which would have to be periodically updated as the ships' improve their operational efficiency.<sup>97</sup>

Whether voluntary or mandatory the use of SEMP which provides the guidelines on how best to manage energy consumption on a ship seems to be a worthwhile approach for developing awareness of measures and operations to be applied in order to reduce emissions and costs and could be relatively simple to develop. The downside of the SEMP is that because it does not prescribe a targeted level of emissions reduction nor does it incentivize investment in abatement technology it will, as a result, be an ineffective mechanism for reducing emissions. However, SEMP would work if other reduction measures are implemented integral to it such as the EEDI and EEOI, which provide incentives for investment such as cost reductions.<sup>98</sup> Energy efficiency improvements and reduction in greenhouse gas emissions for the shipping industry would make it an even more competitive mode of transport, which is of direct benefit to the preservation of our environment, reducing its impact on climate change and benefiting the world economy.

#### **4.5 Precautionary Approach**

The one underlying best practice, which is synonymous with all efforts to develop a legal regime for limiting greenhouse gas emissions from ships, is the application of the principle of precautionary approach. For many international regulatory conventions such as MARPOL, SOLAS and UNFCCC, the principle of precautionary approach is often the underlying motivation for initially developing the legal instrument eg UNFCCC Article 3(3):

The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate

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<sup>97</sup> Ibid.

<sup>98</sup> Ibid.

change should be cost-effective so as to ensure global benefits at the lowest possible cost. To achieve this, such policies and measures should take into account different socio-economic contexts, be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation, and comprise all economic sectors. Efforts to address climate change may be carried out cooperatively by interested Parties.

The declaration of SECAs in the Baltic and North Sea were initiated by a need to limit these emissions. This was as a result of growing concern at the time (and lack of scientific certainty, which can prove otherwise) that emissions such as SO<sub>x</sub> can cause 'acid rain', which destroys crops and can cause severe respiratory diseases in human beings, and is known to influence global climate change.

Likewise scientists have shown that greenhouse gases influence the rate of climate change, but they cannot be absolutely certain of the long term effects. Therefore, policy, law and management decision makers should also adopt the 'precautionary approach' to the development of international law and policies related to the impacts of ship-source greenhouse gas emissions on the marine environment. The precautionary approach will also place the onus of justifying an activity or source of emission such as ship-source greenhouse gas emissions on the polluter/producer of the emissions.

#### **4.6 Regional and State Best Practices**

The following case studies below will discuss current best practices of States and regional organisations towards limiting greenhouse gas emissions from ships.

Firstly, a regional best practices case study of the EU will be discussed. The EU is a good example to analyse, because it has been quite outspoken about combating ship-source greenhouse gas emissions and has even threatened to implement its own regional measures within the next year or two if the IMO and UNFCCC cannot agree on how to regulate greenhouse gas emissions in the shipping industry.

Secondly, the best practices for reducing ship-source greenhouse gas emissions in the USA will be discussed. Even though the USA has not ratified the Kyoto Protocol, yet, it does have a plethora of legislation relating to air pollution and recently in 2008 passed national legislation enforcing MARPOL Annex VI in its jurisdiction. With a new President and administration in 2009, perhaps the USA will

finally acknowledge its role in the fight against climate change and ratify the Kyoto Protocol. The USA is one of the largest emitters of CO<sub>2</sub> in the world.<sup>99</sup>

The third case study on best practices will look at Australia's best practices. The Australians with their vast and diverse country of natural resources and heritage are generally considered to be one of the most environmentally conscious nations in the world and because it is totally surrounded by ocean and somewhat isolated from the major economic markets, Australia relies heavily on the shipping industry for its trade.

Only recently in 2007 did Australia ratify the Kyoto Protocol and even then it seemed to be playing a 'wait and see' game, for it was only after the Russian Federation signed up and the Protocol came into force in 2005, that the Australians under a new government decided it was time to commit to mitigating climate change and come onboard with the rest of the Annex I countries, except the two major powers, USA and China.

### **Case Study 1: European Union**

The EU acknowledges that shipping is a vital mode of transport, which sustains the Union's economic trade and industry and is one the most environmentally friendly and sustainable modes of transport. In fact, sea-borne trade accounts for 90 per cent of the EU's international trade volume and 43 per cent of its domestic trade. EU shipping companies own approximately 33 per cent of the world's merchant fleet and 40 per cent of the EU's total sea-borne trade is transported by EU flagged ships.<sup>100</sup>

The EU has acknowledged that ship-source greenhouse gas emissions are continuing to increase, while global emissions should be stabilising and decreasing. The EU believes that a logical climate policy must be developed in order to address this issue. Therefore, in November 2002, the European Commission (EC) unveiled COM (2002)595 final, an ambitious and determined strategy to reduce greenhouse gas emissions from ships.<sup>101</sup> The strategy report says that the EC must develop a working relationship with the IMO in order for the strategy to have any chance of success and for ship-source greenhouse gas emissions to be reduced. The EU has indicated that it will take its own necessary

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<sup>99</sup> Oceana op cit note 2 at 2.

<sup>100</sup> CE Delft 'Greenhouse Gas Emissions for Shipping' (2006) at 185.

measures if the IMO does not urgently develop and implement a legal regime for limiting greenhouse gas emissions from ships.

Christopher Frisk, Head of Brussels representation for the Swedish Shipowners Association said, 'The European Union is putting pressure on the International Maritime Organisation. They want them to do a lot more... they have said this for quite some time now. If you [IMO] don't get somewhere this year [with respect to limiting greenhouse gas emissions from ships], then we [EU] will act [implement our own regulations in this regard], like it or not...'<sup>102</sup>

Testimony to the above statement is that in November 2008 the British Parliament passed a bill, which is the first legislation of its kind in the world, and will aim to reduce greenhouse gas emissions in Britain by up to 80 per cent by 2050. More significantly it also takes into account emissions from the shipping industry.<sup>103</sup>

The British Government had resisted including emissions from shipping in the bill, because there was '...no agreed method for allocating emissions from international transport...'<sup>104</sup> However, the Government approved a proposal by the former British Environment Minister, Elliot Morley, which outlined the importance of including greenhouse gas emissions from international shipping in the national carbon emissions budget. British Climate Change Minister, Joan Ruddock, recently spoke to officials in the US Congress who praised the way British lawmakers worked together on such an important issue.<sup>105</sup>

A special EC study has developed seven key policies for the States of the EU and its respective ship operators and ship owners to tackle ship-source greenhouse gas emissions, which are as follows:<sup>106</sup>

1. Voluntary agreements.
2. IMO CO<sub>2</sub> indices ie the EEDI and the EEOI.
3. Unitary CO<sub>2</sub> index cap or target.

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<sup>101</sup> Ibid.

<sup>102</sup> Sustainable Shipping News op cit note 42.

<sup>103</sup> Sustainable Shipping News, 'Britain passes climate change bill' (2008).

<sup>104</sup> Ibid.

<sup>105</sup> Ibid.

4. Inclusion of other greenhouse gas emissions such as refrigerant gases in a system similar to the CO<sub>2</sub> index.
5. Inclusion of mandatory port charges (differentiation of harbour dues) for CO<sub>2</sub> emissions.
6. Develop an ETS for the shipping industry in the EU.
7. Allocation of emissions to EU member States.

The study assesses these policies based on four essential criteria:<sup>107</sup>

1. Operational effectiveness ie what quantity of CO<sub>2</sub> will be reduced by implementing the policy and what degree of incentive does the policy provide to reduce emissions?
2. Legal implications ie EU and international jurisdiction.
3. Feasibility of monitoring and enforcement ie business, administrative capability for reporting, monitoring and enforcing.
4. Feasibility of implementation ie additional information and studies required on developing legislation and business management before implementing.

An assessment of these policies produced options, which were deemed to have limited effect on reducing ship-source greenhouse gas emissions, and options which could have a positive effect.

Voluntary agreements are not expected to have a significant impact on reducing ship-source greenhouse gas emissions. Currently there are little or no organisations willing to enter into voluntary commitments. Voluntary agreements could support the main legal instruments for limiting ship-source greenhouse gas emissions, but they can never effectively replace them.<sup>108</sup>

The proposed technical policies of the IMO such as the EEDI and EEOI are possible to implement especially with respect to EU flagged ships. The data collected on greenhouse gas emissions from the EU shipping fleet will provide

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<sup>106</sup> CE Delft op cit note 100 – The study was carried out by CE Delft, an independent not-for-profit consultancy in the Netherlands, which specialises in maritime policy and provides services to the IMO, UNFCCC, European Commission, Governments and other NGO's.

<sup>107</sup> CE Delft op cit note 100.

<sup>108</sup> Ibid.

additional information and understanding on technical and operational factors and will provide valuable insight for developing these policies as well as market-based policies such as the ETS. In addition, ship owners and operators can use the data for monitoring and analysing ship performance.<sup>109</sup>

Additional EU legislation needs to be drafted in order to include refrigerant gases in EU regulations. It is not clear if the current regulation of refrigerant gases extends to ships outside the territorial waters. The effect of reducing refrigerants would be small. However, relatively simple operational measures can be taken by the ship operators to limit the emission of refrigerants and this policy is worthwhile pursuing.<sup>110</sup>

Allocation of emissions from a ship directly to an EU member State is not a particularly simple task to do, nor would this be a worthwhile policy to follow. In an industry as global as shipping is, national and unilateral policies and measures are unlikely to be effective and may give rise to evasion and competitive distortion such as flagging out ie FOC. The EU suggests that an integrated approach to allocating emissions is required, which addresses all the commitments, policies and regulations required in order to successfully develop a system for allocating emissions.<sup>111</sup>

According to the EU, the ETS is probably the most likely market-based regime for limiting ship-source greenhouse gas emissions. Under this option, ship operators calling at EU ports would have to surrender allowances for their CO<sub>2</sub> emissions on their voyage to an EU port. Such a policy would be in line with current developments in the EU, directed at the inclusion of aviation into an ETS. Furthermore, it would allow ship operators considerable flexibility in taking measures to reduce emissions.<sup>112</sup>

Another promising policy option to adopt is a differentiation of harbour dues. This is when ports give a refund or discount on their harbour dues to ships that emit less than a certain threshold of emissions, and charge ships higher dues if they exceed their allowable emission limits. This instrument could be designed to give operators flexibility in the measures required to reduce emissions and it could lead to increased ship operational efficiency within the port, because there will

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<sup>109</sup> Ibid.

<sup>110</sup> Ibid.

<sup>111</sup> Ibid.

ultimately be a financial incentive to limit emissions. It would be an economic, market-based instrument for which most institutions are currently in place, which makes it cheaper and administratively simpler to implement.<sup>113</sup>

The main obstacle that would have to be overcome before this option could be implemented would be the identification of a ship-source greenhouse gas emissions baseline that will be environmentally effective and technically attainable. The IMO CO<sub>2</sub> index could prove to be an effective system for monitoring the emissions from ships, but the current understanding of the index is still limited. Furthermore, there is the possibility that this policy could increase competition between ports and could even lead to the development of ports of convenience, a similar principle to flagging out.<sup>114</sup>

As mentioned earlier, the CO<sub>2</sub> index or EEDI and EEOI are ship-specific indicators of the amount of CO<sub>2</sub> emitted per amount of transport work. Ship operators can reduce their index by operational measures such as slow steaming or full loading or by technical measures such as increased hull maintenance. A requirement to meet an index limit value would still allow ship operators to choose measures from a wide array of technical and operational options. As a result of this flexibility the cost effectiveness of this option could be good. However, it would need to be demonstrated that it is indeed possible to calculate a CO<sub>2</sub> index limit value that would not be dominated by external factors such as transport demand, and would take the large variety of ships into account.<sup>115</sup>

## **Case Study 2: United States of America**

In a study by the International Council on Clean Transportation (ICCT) in 2007,<sup>116</sup> an overview of the USA's best practices towards controlling ship-source emissions (including greenhouse gas emissions) was discussed. The study specifically covered why the USA and its State of California are taking action to limit emissions such as greenhouse gases from ships and what policies are being implemented. Firstly, the study discussed the USA's programmes to address ship emissions and

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<sup>112</sup> Ibid.

<sup>113</sup> Ibid.

<sup>114</sup> Ibid.

<sup>115</sup> Ibid.

<sup>116</sup> Fanta Kamakate and Drew Kodjak 'Overview of Current and Proposed Policies in the United States' (2007) The International Council on Clean Transportation (ICCT).

secondly it looked at the domestic programme, being developed in the State of California and along the US West Coast to reduce ship-source emissions.

In 2007, the USA became actively involved in negotiations with the IMO to amend sections on NO<sub>x</sub>, SO<sub>x</sub> and PM of MARPOL Annex VI. Finally, in 2008 the revision of MARPOL Annex VI and the proposed new Technical Codes on these emissions were formally adopted by the MEPC of the IMO.<sup>117</sup>

In a press statement following the 58<sup>th</sup> meeting of the MEPC in October 2008, when the revised MARPOL Annex VI was approved, the MEPC Chairman described the outcome as a '...magnificent and monumental adoption of the IMO regulation that addresses air pollution from ships. This deserves applause; we are adopting an historic agreement... the success story of the MARPOL Annex VI revision boded well for the IMO's on-going efforts to address shipping's greenhouse gas emissions....'<sup>118</sup>

The USA formally ratified MARPOL Annex VI on 9 October 2008 and became the 53<sup>rd</sup> State to do so.<sup>119</sup> The revised MARPOL Annex VI legislation will come into force from 1 July 2010, and will apply to US territorial waters, and all US ports and US flagged merchant ships.<sup>120</sup>

On a domestic scale within the USA, the West Coast Governors of California, Oregon and Washington States have come together and adopted an '...historic action plan...' <sup>121</sup> called the Ocean Action Plan, which will address ship-source emission standards, environmental sustainability and marine waste pollution. The three States will work together with the other stakeholders such as: ship owners and operators, ocean-users, federal agencies, academic institutions and other regional entities. The governors have sent a joint letter to the US Congress asking for US\$ 5 million <sup>122</sup> in federal support for implementation of the action plan. The recently ratified MARPOL Annex VI Act will work alongside the new action plan to limit ship-source emissions and help clean up air quality.

In July 2008, the US States of California, Connecticut, New Jersey, Oregon, Pennsylvania and New York announced that they intended to take legal action

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<sup>117</sup> Sustainable Shipping News, 'MEPC adopts MARPOL Annex VI revision' (2008).

<sup>118</sup> Ibid.

<sup>119</sup> Sustainable Shipping News, 'US formally ratifies Annex VI' (2008).

<sup>120</sup> Ibid.

<sup>121</sup> Sustainable Shipping News, 'Schwarzenegger's "aggressive" plans' (2008).

<sup>122</sup> Ibid.

against the United States Environmental Protection Agency (EPA) if regulations were not implemented as soon as possible to reduce greenhouse gas emissions from ships. These States requested that the EPA develop standards for ships to burn cleaner fuels, travel at slower speeds and plug into shore power when docked at port (cold-ironing).<sup>123</sup>

In the case of *Massachusetts et al v Environmental Protection Agency et al*, 549 US \_\_\_ (2007), the US Supreme Court ruled that the EPA has the authority to regulate CO<sub>2</sub> and other greenhouse gases linked to climate change. Furthermore, the Supreme Court held that it is not necessary for the EPA to regulate greenhouse gas emissions if the EPA can prove that the greenhouse gas emissions are not a danger to public health.<sup>124</sup>

In 2008, an Advanced Notice of Proposed Rulemaking (ANPR) was issued by the EPA with support from the US Department of Energy, the US Department of Transportation and the US Department of Commerce over their concerns of the apparent unsuitability of the Clean Air Act (CAA) in regulating ship-source greenhouse gases.<sup>125</sup> The EPA has shown that the CAA is incapable of implementing a climate change programme, as it focuses on more local and traditional air pollutants, which disperse within a few hours, days or weeks. Greenhouse gases, however, remain in the atmosphere for much longer periods and disperse over much greater areas and therefore do not necessarily originate from local emission sources.

The EPA Administrator, Stephen L. Johnson, has called for the US Congress to develop a new legal framework for limiting greenhouse gas emissions from ships in-line with current international regulatory developments, saying that: '...promulgating a programme under the CAA would take years to issue and the rule would then be litigated for years to come....'<sup>126</sup>

Under the US CAA, the shipping industry must consider the reduction of greenhouse gas emissions in new ship designs and marine operations.<sup>127</sup> This requires improving the design of ships so as to improve ship performance, which improves fuel consumption and therefore lowers CO<sub>2</sub> emissions. Slower and more

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<sup>123</sup> Sustainable Shipping News, 'US states threaten to sue EPA' (2008).

<sup>124</sup> Sustainable Shipping News, 'EPA questions emissions regulation' (2008).

<sup>125</sup> Ibid.

<sup>126</sup> Ibid.

<sup>127</sup> Ibid.

economical cruising also significantly reduces CO<sub>2</sub> emissions as well as effective cargo loading, route planning and efficient port operations management.

The EPA is now putting the onus of developing a legal regime for limiting ship-source greenhouse gas emissions on the shoulders of the US Congress. Thus far the US Congress has been unable to gather enough support to develop legislation for an ETS or equivalent cap-and-trade system for limiting greenhouse gas emissions.

However, with a new US Government in control from 2009, the USA's climate change issues could receive more focus from the US Administration than in the past. EPA rulemakings will continue to move forward, although the current economic recession could play a large role in the success of passing US ship-source greenhouse gas emissions reduction legislation.

### **Case Study 3: Australia**

A study called *Climate Change and Australian Coastal Shipping* was commissioned by the Maritime Union of Australia and completed by the Australia Institute in October 2007. The Union asked for an evaluation of the nature of the threat posed by climate change and the policy response that will be necessary to minimise the risks associated with global warming in order to better determine what Australia's best practices should be towards limiting greenhouse gas emissions in the transport sector. An initial response to the Union's request for a policy in Australia to limit the risks associated with climate change on shipping and to cut emissions enough to make any significant reduction is that it '...will require an unprecedented level of international cooperation and a willingness on behalf of governments, business and the broader community to accept the economic costs associated with the required greenhouse gas policy responses....'<sup>128</sup>

The Australians are focused on applying structural changes to their transport system to make it a more environmentally sustainable one with the least amount of economic impact. The outcome of the study on greenhouse gas emissions from the Australian transport sector is that coastal shipping in Australia does produce far less greenhouse gas emissions than other modes of transport. A national policy for developing a modal shift towards favouring coastal shipping in general is encouraged, as shipping is more environmentally sustainable. However, coastal

shipping in Australia does not have enough critical freight mass to compete economically with road and rail and therefore, the conclusion for Australia is that ‘...actively pursuing mode shifting from land modes to coastal shipping as a means of reducing emissions is unlikely to be an effective or efficient greenhouse strategy....’<sup>129</sup> A country such as Australia, which is surrounded by ocean, is clearly dependent on international shipping for its imports and exports. Therefore, it should in the context of ‘dangerous climate change’, seriously consider future best practices required for an international legal system limiting greenhouse gas emissions from ships entering and leaving its shores or flying the flag of Australia.

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<sup>128</sup> Macintosh op cit 13 at VI.

<sup>129</sup> Ibid at 75.

## 5 CHAPTER 5: CONCLUSIONS

In closing; the essence of the argument in this minor dissertation for developing a legal regime for limiting ship-source greenhouse gas emissions is captured in the IMO's Secretary-General Efthimios E. Mitropoulos's opening speech at the 58<sup>th</sup> meeting of the IMO's MEPC in October 2008, where he made the following statement:

To succeed in this, we should, ultimately, come up with a regime that will contribute positively, fairly and visibly to the wider efforts of the international community to combat climate change; a regime whereby all IMO Members engage in effectively reducing greenhouse gas emissions from international shipping in its entirety - not a small fraction thereof - and, in doing so, make sure that the special needs of developing countries are fully and comprehensively addressed.<sup>130</sup>

As stated many times in this dissertation, the shipping industry is a particularly global and highly complex industry with numerous factors, which have to be considered towards developing a legal regime for limiting ship-source greenhouse gas emissions. In addition, the mandate for climate change as set out by the UNFCCC and the Kyoto Protocol must also be considered.

Since the IMO was established in 1948, one of its founding principles has been to develop international regulations that are followed by all shipping nations regardless of whether or not they are of a developed or developing status. In contrast, the requirements for limiting climate change as per the UNFCCC and the Kyoto Protocol are based on differentiated responsibilities, which focus on the duties of individual nation-states to limit greenhouse gas emissions.

If only Annex I nations are included in a legal framework to limit ship-source greenhouse gas emissions then this would in effect create a double standard in the industry. Thereby, Non-Annex I countries would operate according to one set of rules and Annex I countries to another set of rules. In an industry as global as shipping is this would not make sense. How can you possibly differentiate one ship from another based purely on the flag it flies when the ship could be owned by a variety of nationalities of owners and charterers, it could be transporting cargo from a multitude of different nationalities of cargo owners to many different international ports and it could have taken bunkers onboard from a variety of different sources.

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<sup>130</sup> Sustainable Shipping News, 'IMO Secretary-General: Shipping must stand up to responsibilities' (2008).

Therefore, assigning greenhouse gas emissions to a ship, based on its particular flag State is not a sensible concept when the shipping industry is in reality a global industry with often complex ownership structures and a variety of different cargo owners and bunker sources.

In shipping the flag State of a ship does not necessarily reflect a genuine link with that country. This dissertation has briefly touched on FOC ships and it suffices to say here without going into further detail, that if a legal framework for limiting greenhouse gas emissions from ships differentiates between flag States then it could create the opportunity for flagging out. This goes against the principles of free and fair global trade in the industry and fundamentally goes against the founding principles of the IMO.

The LOSC lays down the jurisdiction of the maritime zones and sets the international standards and regulations for States to protect and preserve the marine environment from pollution. It is customarily accepted under international law that ships will comply with GAIRS, which are dictated by the international law of the sea and the IMO conventions and States will apply AIRS to ships in their territorial waters. Of particular relevance in this case is the IMO's convention on the prevention of air pollution from ships, MARPOL Annex VI.

Collaboration between MARPOL and the UNFCCC is possible if market-based mechanisms and technical measures are used such as the proposed METS and ICF schemes. The systems for monitoring emissions such as the EEDI and EEOI for new and existing ships as well as SEMP should be included in a chapter on greenhouse gas emissions in MARPOL Annex VI. This is consistent with the format in which other emissions under this Annex are covered such as SO<sub>x</sub> or NO<sub>x</sub>.

However, Dr. Stochniol's IMERS policy of global, but differentiated responsibilities for limiting ship-source greenhouse gas emissions is argued to be the best scheme for the shipping industry, because it meets the requirements of the nine principles proposed at the MEPC 57, whereby the IMO called for a global approach to limiting greenhouse gas emissions and it also meets the requirements for differentiated responsibilities as per the UNFCCC.

A single all encompassing international legal regime is required for limiting ship-source greenhouse gas emissions, as was argued for in this minor dissertation. Such a legal instrument can only succeed if there is consensus

amongst Parties of the IMO and the UNFCCC for a uniform global, but differentiated responsibility mandate towards limiting ship-source greenhouse gas emissions. Regulations and administration aimed at reducing greenhouse gas emissions from shipping should be the responsibility of the IMO and any measures the IMO agrees to should apply to all ships irrespective of the flag they fly. Furthermore, regulations through local or regional legislation should be avoided, so that an all encompassing international framework can be implemented. A legal framework for limiting ship-source greenhouse gas emissions should then be incorporated into a special chapter on greenhouse gas emissions, which can be incorporated into a revised MARPOL Annex VI, with tacit acceptance.

We have entered the '11<sup>th</sup> hour' in our battle to curb climate change and as inconvenient as the truth may be, it is the shipping industry's duty to act now if it wishes to make any significant contribution to mitigating climate change. A uniform international legal regime limiting ship-source greenhouse gas emissions must be developed and implemented as soon as possible. The most effective and efficient way to do this is to through the IMO and its existing legal instrument for preventing air pollution from ships, MARPOL Annex VI.

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## 6 APPENDIX

**Table 1:** UNFCCC – Annex I and II Countries incl. Kyoto Protocol – Annex B.

Party	Annex I	Annex II	Quantified limitation or reduction commitment  (per cent of base year or period)
Australia	✓	✓	108
Austria	✓	✓	92
Belarus	✓		N/A
Belgium	✓	✓	92
Bulgaria	✓		92
Canada	✓	✓	94
Croatia	✓		95
Czech	✓		92
Denmark	✓	✓	92
EEC	✓	✓	92
Estonia	✓		92
Finland	✓	✓	92
France	✓	✓	92
Germany	✓	✓	92
Greece	✓	✓	92
Hungary	✓		94
Iceland	✓	✓	110
Ireland	✓	✓	92
Italy	✓	✓	92
Japan	✓	✓	94
Latvia	✓		92
Liechtenstein	✓		92
Lithuania	✓		92
Luxembourg	✓	✓	92
Monaco	✓		92
Netherlands	✓	✓	92
New Zealand	✓	✓	100
Norway	✓	✓	101
Poland	✓		94

Portugal	✓	✓	92
Romania	✓		92
Russia	✓		100
Slovakia	✓		92
Slovenia	✓		92
Spain	✓	✓	92
Sweden	✓	✓	92
Switzerland	✓	✓	92
Turkey	✓		N/A
Ukraine	✓		100
UK	✓	✓	92
USA	✓	✓	93

**Table 2:** Distribution by flag of the world merchant fleet.

It may be noted that, in accordance with Lloyd's Register Fairplay's database, as at 1 March 2008, the distribution by flag of the world merchant fleet of registered ships above 400 GT was as follows:

	<b>Number of ships</b>	<b>Gross Tonnes (GT)</b>	<b>Deadweight Tonnes (DWT)</b>
<b>Annex I flag States</b>	20,872 (33.42 per cent)	209,015,681 (26.08 per cent)	263,820,104 (22.82 per cent)
<b>Non-Annex I flag States</b>	41,119 (66.58 per cent)	593,330,359 (73.92 per cent)	892,384,249 (77.18 per cent)
<b>Total</b>	61,862	801,346,040	1,156,204,353

**Source:** IMO, Latest GHG Considerations within IMO - Outcome of the fifty-eighth session of Marine Environment Protection Committee, 16 to 18 February 2009.

**Table 3:** Policy instruments to incentivize emissions reductions.

<b>Policy Instrument</b>	<b>Description</b>	<b>Viable option?</b>
<b>Carbon charge on bunker fuel</b>	Increasing fuel costs by imposing an additional cost on fuel to reflect its carbon content.	Not at a regional level due to the huge scope for evasion – requires global agreement.
<b>Voluntary programme agreements</b>	Agreement on a voluntary basis to: adopt emission or efficiency standards, or adopt certain approved practices, or report on emissions or efficiency levels and actions being taken to improve them.	Not found to be a viable approach for significant reductions on a global scale.
<b>Environmental indexing</b>	Use environmental criteria to give vessels an index indicating the environmental performance of the ship. This can be used to differentiate taxes, port dues and charges, insurance rates and financial conditions.	Not seen as a very efficient tool to reduce emissions even if some reductions could be achieved on a voluntary basis.
<b>Emissions trading</b>	The inclusion of the shipping sector within an ETS: allocating emissions allowances to owners, difficulty in allocation and setting of cap levels.	Allocation of allowances to ship owners was not viable.

<b>Emissions credits sales</b>	Through a system for creating emissions credits, for example through the use of CDM. A baseline would need to be established in order to judge the improvement level and therefore the number of allowances allocated.	A system for creating emissions credits may be a way to include shipping in a general trading system.
<b>Energy or emission efficiency standards</b>	Setting a minimum standard for existing ships and basing a standard for new ships on ship design parameters. It should relate to function and not technology.	These are feasible, although it is questionable as to whether they are cost effective.

**Source:** IMO, Study of Greenhouse Gas Emissions from Ships Issue no. 2 (31 March 2000).

**Table 4:** Individual technical measures and their reduction potential for existing ships.

<b>Measures</b>	<b>Description</b>	<b>Fuel/ CO<sub>2</sub> Saving potential</b>
<b>Optimal hull maintenance</b>	Use of self polishing paint, improved practice during maintenance and re-blasting the hull.	3 to 5 per cent
<b>Propeller maintenance</b>	Reduce propeller roughness through polishing.	1 to 3 per cent
<b>Fuel injection</b>	Modification so that the amount of fuel is injected over a shorter period of time.	1 to 2 per cent
<b>Fuel (HFO to MDO)</b>	Change from heavy fuel oil to marine diesel oil reduces emissions due to the lower carbon/hydrogen ratio.	4 to 5 per cent
<b>Efficiency rating</b>	Engine upgrade including increased compression ratio and changes to fuel injection.	3 to 5 per cent
<b>Efficiency rating and turbo charger upgrade</b>	Engine upgrade including increased compression ratio and changes to fuel injection combined with a turbo charger upgrade.	5 to 7 per cent

**Source:** IMO, Study of Greenhouse Gas Emissions from Ships Issue no. 2 (31 March 2000).

**Table 5:** Individual technical measures' reduction potential for new ships.

<b>Measures</b>	<b>Description</b>	<b>Fuel/ CO<sub>2</sub> Saving potential</b>
<b>Optimised hull shape</b>	Change the design of the hull - optimising fuel consumption.	5 to 20 per cent
<b>Choice of propeller</b>	Optimising the propeller type to suit the function of the vessel.	5 to 10 per cent
<b>Efficiency optimised</b>	Combined set of measures, particularly increased compression ratio and redesign of fuel injection (higher fuel nozzle opening pressure and injection pressure).	10 to 12 per cent (state of the art technique in medium speed engines)  2 to 5 per cent (slow speed engines when trade off with emissions of NO <sub>x</sub> accepted)
<b>Fuel (HFO to MDO)</b>	Change from HFO to MDO reduces emissions due to the lower carbon/hydrogen ratio.	4 to 5 per cent
<b>Plant Concepts</b>	Diesel-electric propulsion allows for better fuel consumption.	4 to 6 per cent
<b>Machinery monitoring</b>	Incorporating more regular use of systems for monitoring machinery efficiency and planning related maintenance and adjustments based on an optimum time interval.	0.5 to 1 per cent

**Source:** IMO, Study of Greenhouse Gas Emissions from Ships Issue no. 2 (31 March 2000).

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